LETTER TO THE EDITOR

COMMENTS ON "MODELING OF PELLET ACCELERATION BY TWO-STAGE GUNS"

The March 1989 issue of *Fusion Technology* leads off with a technical paper entitled "Modeling of Pellet Acceleration by Two-Stage Guns" by Giulio Riva and Adolfo Reggiori.[1] Reading this paper caused me to reminisce. Among their references, Riva and Reggiori included A. E. Seigel and R. Piacesi. I had the privilege of working under Arnold Seigel in the period when he produced the referenced work, with Bob Piacesi as one of my co-workers at the time.

I read with particular interest the section entitled "The Constant Pressure Condition Behind the Pellet." Theoretically, at least, if the pressure is properly controlled at the barrel inlet, a constant pressure can be maintained at the base of the pellet as it traverses the barrel (the optimum condition). Unfortunately, a shock wave will appear all too soon, precluding this most desirable condition. The authors correctly acknowledge that this ideal situation is hardly realizable. Nonetheless, as they point out, the exercise of calculating the conditions necessary to attain a constant pressure at the pellet has utility. Riva and Reggiori first treat the scenario where subsonic flow exists at the barrel inlet; but it does not take long before the inlet flow becomes sonic, requiring quite different treatment (the authors also addressed this). However, the theory also predicts the existence of a third, rather peculiar scenario. Under certain conditions, the flow at the inlet begins subsonic, reaches sonic, but then must revert to subsonic in order to maintain constant pressure at the pellet.[2] This has always struck me as a curious and unexpected phenomenon. A fairly comprehensive treatment of constant base pressure theory was done by Ernst Winkler, around 1966.

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REFERENCE

1. G. RIVA and A. REGGIORI, "Modeling of Pellet Acceleration by Two-Stage Guns," *Fusion Technol.*, **15**, 143 (1989).

2. D. N. BIXLER and A. E. SEIGEL, "Calculations of the Flow Conditions in a Constant Base Pressure Launcher with a Real Gas Propellant," NOLTR 66-157, Naval Ordnance Laboratory (1966).