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FEASIBILITY STUDY FOR THE DEVELOPMENT OF A SMOKE TRACER FOR AN APDS SHOT

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Abstract: A feasibility study of a smoke or vapor stream system to function in the nose cone of a fin-stabilized round was conducted. The conventional base-located system could not be used because (a) the round contained a discarding sabot mechanism, and (b) the vibration, jolt, and dust following the discharge of the large vehicle-mounted gun would cause the gunner to momentarily lose sight of the missile. Hence, a persistent trail observable by daylight was needed. Titanium tetrachloride was tried because, on exposure to air, it forms dense white clouds of titanium hydroxide. However, the corrosive properties of this material made it difficult to package. Since calculations indicated that nose temperatures exceeding 300 deg C would be attained during projectile flight, a new approach using a heat sensitive initiator was formulated. Diazodinitrophenol (DDNP), which ignites after 0.25 second of flight (200 deg C) was pressed into the nose cone tip assembly. A conically shaped red smoke composition was inserted directly behind the DDNP. Two holes drilled near the apex of the cone body allowed the generated smoke to escape. This approach worked satisfactorily in static tests. In ballistic tests, however, the smoke composition was ejected as a puff of red smoke with no streaming.

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