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14. ABSTRACT

The general trend in rocket propulsion in the US has been geared towards performance, cost and multi-mission capability. The developing trends have begun to appear in the areas of hazards mitigation in our munitions. This has led to a focus on increasing performance without increasing susceptibility to external input such as fire or shock. Therefore there has been an interest in the underlying principals of rocket propulsion focusing on the detailed mechanics of combustion and IM response, leading to an increase in modeling focused programs.

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Area of Interest – Rocket Propulsion

US Annual Report 2009

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Trends

The general trend in rocket propulsion in the US has been geared towards performance, cost and multi-mission capability. The developing trends have begun to appear in the areas of hazards mitigation in our munitions. This has led to a focus on increasing performance without increasing susceptibility to external input such as fire or shock. Therefore there has been an interest in the underlying principals of rocket propulsion focusing on the detailed mechanics of combustion and IM response, leading to an increase in modeling focused programs.

Key Technology Trends:

- Detailed modeling of solid rocket motors
- Energy management
- IM
- Integrated Vehicle Health Management
- Improved designs/component for sustainable and long life motors

US Air Force

Component Technology:

- Advanced Rocket Motor Propulsion

Objective – to develop advanced components and materials for solid rocket motors, analysis capabilities, and health monitoring technologies, to achieve increase in ISP, MF, reduce cost, and increase service life.

Goal – reduce life cycle cost, increase understanding of each motor, reduce failure, reduce margins, increase performance

Approach – upgrade current computer modeling capability, development of baseline IVHM system(s), validation of increased fidelity toolsets, qualification of domestic fiber supplies, studies of new materials for insulation. Investigations into new alloys for rocket motor inert components and new manufacturing techniques.

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- Technology for multi-pulse/controllable solid rocket motors

Objective - to develop technologies for controllable solid rocket motors

Goal – Increase controllability/manufacturability, reduce cost/complexity of controllable solid rocket motors

Approach – Advanced low-weight controllable barriers, advanced pintle control code, as well as a research study involving various motor configurations.

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- Advanced Modeling of Solid Rocket Motors

Objective – to develop physics based models for increased fidelity in rocket motor modeling

Goal – reduce failure, reduce margins, increase performance

Approach – upgrade current computer modeling capability to include new technology and take advantage of the increase in computer power, upgraded heat transfer modeling, 2 phase flow modeling, ablation modeling, fluid thermal structural interaction.

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Propellants

- Advanced Propellant Program

Objective – increase in ISP, density and no change in hazard class for boost propulsion

Goal – increase energy density, reduce hazards of high performance ingredients

Approach – incorporate new energetic ingredients into propellant formulation, including energy partitioning, and reduced sensitivity materials and techniques.

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