**Table 4:** Comparison of propellant performance characteristics.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Propellant** | **Hydrazine** | **LMP-103S** | **AF-M315E** | **H2O2/ABS Hybrid** |
| Flame Temperature | 600-750 ℃ | 1600 ℃ | 1900 ℃ | 2900℃‡‡‡‡ |
| *Isp*, *sec* | 220-225  | 252 (theory), 235 (delivered)  | 266 (Theory)245 (Delivered) | 324 (Theory)302 (Delivered)§§§§ |
| Specific Gravity | 1.01 | 1.24 | 1.465 | 1.392 (90% H2O2) |
| Density Impulse, *N-sec/liter* | 22705 | 3125 (theory)2915 (delivered) | 3900 (Theory)3650 (Delivered) | 4450 (Theory)4002 (Delivered) |
| Preheat Temperature | 315 ℃, cold-start capable | 300 ℃ | 370℃ | N/Anone-required |
| Required Ignition Input Energy, *Joules* | N/A  | 18,000 J (10 Watts @ 1800 seconds)  | 27,000 J (15 Watts @ 1800 seconds | 2-8 J (8-16 Watts for 250-500 msec) |
| Propellant Freezing Temperature | 1-2 ℃ | -7 ℃ | < 0 ℃ *(forms glass, no freezing point)* | -10 ℃(*90% concentration*) |
| Cost | $ | $$$ | $$$$ | $ |
| Availability | Readily Available | Restricted Access | Limited Access | Very Widely Available\*\*\*\*\* |
| NFPA 704 Hazard Class |  |  | ††††† |  |

‡‡‡‡Due to high pyrolysis energy of ABS (3.1 MJ/kg), the ABS Hybrid motors are self-ablative and do not get externally hot.

§§§§Extrapolated to vacuum conditions based on ground test data.

\*\*\*\*\*80-90% solutions easily condensable from 30% agricultural/food grade solutions.

†††††Ratings based on the highly-toxic constituent components, Hydroxyl Ammonium Nitrate (HAN) and 2-Hydroxyethylhydrazine (HEHN).