

EVALUATING SOLID ROCKET MOTOR INDUSTRIAL BASE CONSOLIDATION SCENARIOS

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The Problem

Diminishing demand for large solid rocket motors (SRMs) since 2010, coupled with plans to end NASA's programs that utilize them, has caused DoD concern regarding SRM industrial base sustainability and unit cost increases.


DoD depends on private industry to design and produce its weapon systems. A healthy industrial base for weapon systems is needed to ensure competition exists to control price and create multiple procurement options; redundancy of prime and sub-tier suppliers; and a continuous labor pipeline of scientific, engineering, and manufacturing expertise. DoD's demand for these weapons significantly affects the survivability of corporations as well as that of sub-tier suppliers. In addition, corporate choices to consolidate or leave the DoD market also have an impact on the defense supply market. DoD is increasingly finding itself with scarce suppliers for many commodities.

One recent example is the large solid rocket motor (SRM) industrial base, which has been reduced to two prime manufacturers—Aerojet and ATK—and faces extensive challenges with ever-decreasing demand from NASA and DoD. As a result of significant decreases in demand, the industrial base was oversized for expected large-SRM production, and SRM stakeholders became increasingly concerned about resulting unit cost increases and industry viability. In 2010, the Congress directed DoD and NASA to develop an industrial base sustainment plan for large SRMs.

IDA was asked to evaluate (1) whether the SRM industrial base could withstand the near-term and long-term impacts of decreased SRM demand as they were envisioned in 2010, (2) whether there are viable consolidation options, and (3) the long-term costs/savings and schedule impacts of consolidation.

STRUCTURE AND HISTORY OF THE SRM INDUSTRIAL BASE AND DEMAND FOR SRMs

Once composed of six SRM suppliers in the 1994 timeframe, the current SRM industrial base now comprises only two manufacturers—Aerojet and ATK. In addition, both companies rely on a very thin industrial base of sub-tier, often single source, suppliers. For example, AMPAC (WECCO) is the single source supplier of ammonium perchlorate, a ubiquitous



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and major component of propellant for SRMs.

The federal government, primarily through NASA and DoD, is largely a sole consumer, purchasing SRMs for space launch, strategic systems, missile defense (both large and small SRMs), and tactical systems. Figure 1 depicts examples of these SRMs, of which space launch at NASA consumed the most propellant by a large margin. Figure 2 depicts the historical demand for SRM propellant during 1990-2010 and the anticipated demand for propellant for 2011-2027. The significant drop in the 2010-2011 timeframe was due to the end of the space shuttle program and the cancellation of the Constellation

program. However, decreases in demand for strategic systems also contributed to this decrease.

VIABILITY OF SRM PRIME CONTRACTORS AND SUB-TIER SUPPLIER RISKS

IDA interviewed representatives from GenCorp (Aerojet), ATK, and AMPAC and evaluated their companies' credit metrics against a set of benchmark companies (Pre-Castparts, Hexcel, S&P 500, DoD Primes). All three companies stated that they could withstand the decreased demand. Our evaluation of the credit metrics led to the following conclusions:

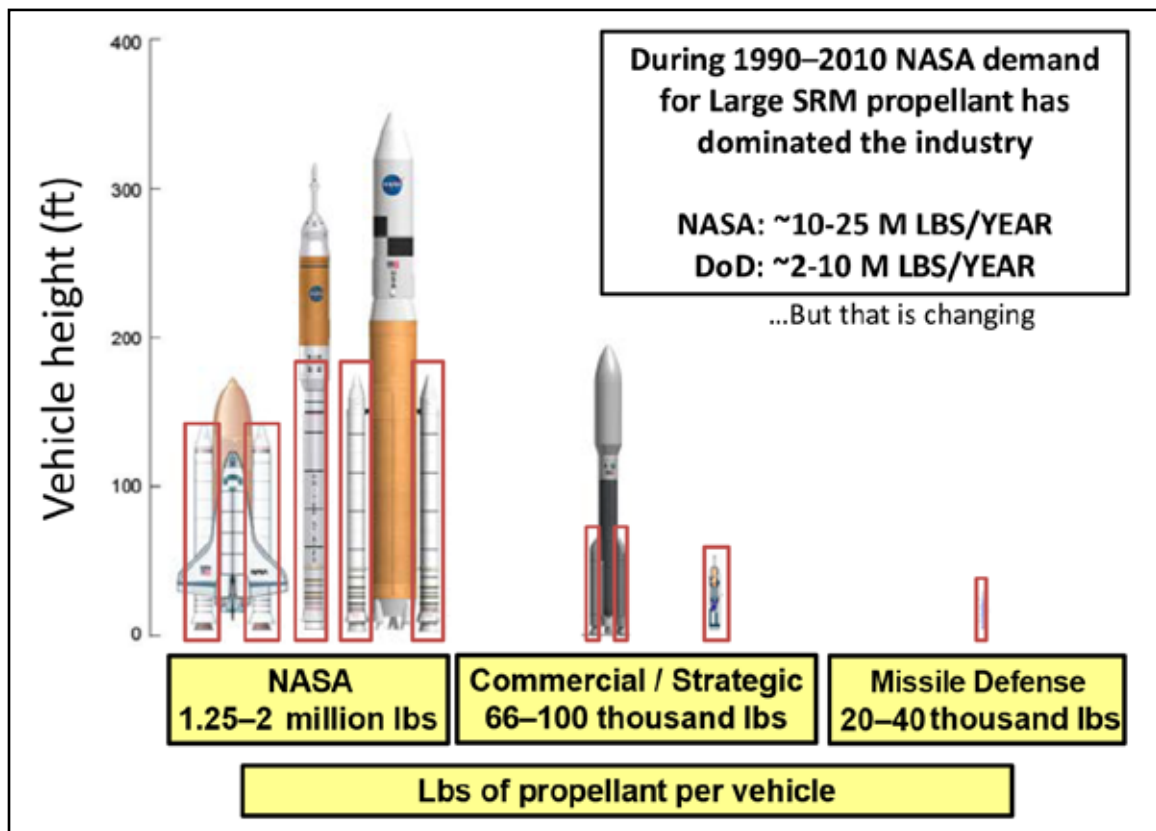


Figure 1. Examples of Current and Planned Large SRM Platforms

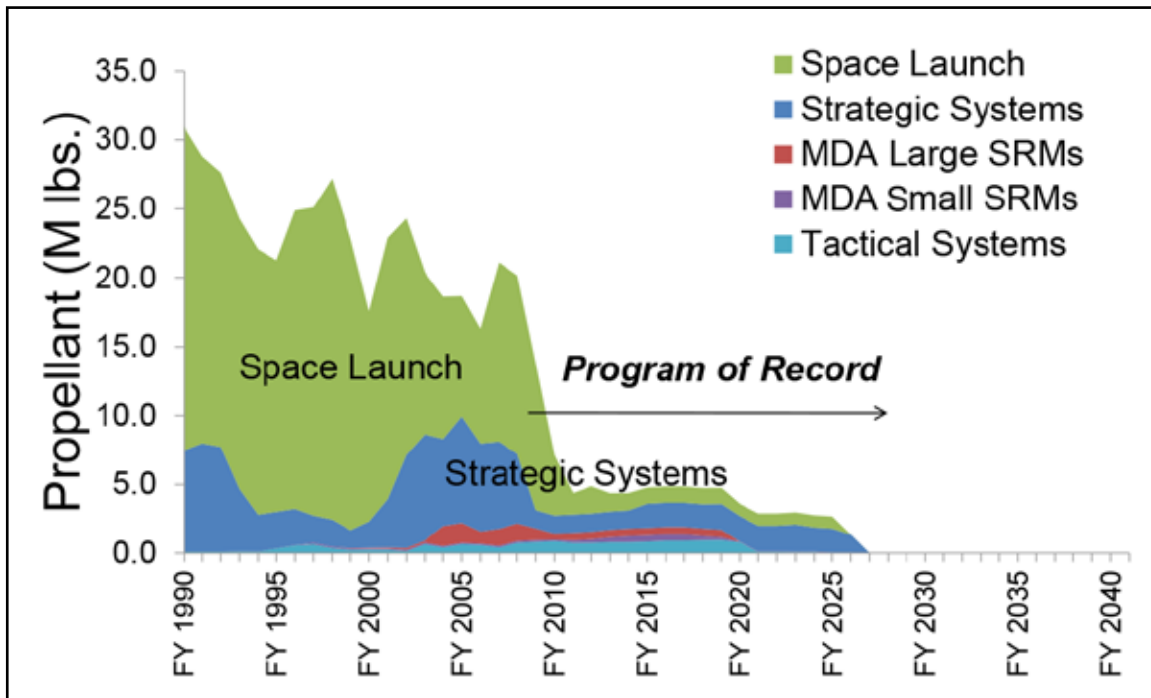


Figure 2. Historical and Future Demand for Large SRMs

1. SRM motor firms are rated high yield, also known as “junk” (below BBB-).
2. SRM firms are significantly more leveraged than the benchmarks; however, this should be manageable in the near term.
3. AMPAC’s interest coverage ratio implies a D rating—cash is declining when most firms are accumulating; however, the ammonium perchlorate business is very profitable.

Thus, although there is some risk, the SRM primes will be viable in the near term.

IDA also evaluated sub-tier suppliers. Figure 3 displays actively managed suppliers grouped by our evaluation of the risk associated with each. The level of risk was assigned based on the number of programs affected, various supply

issues, and whether they were a single manufacturer or sole source (or foreign supplier). An additional fourteen materials (top of Figure 4) have the potential to affect multiple programs or families of SRMs; four of these were from foreign suppliers. Seven additional materials (bottom of Figure 4) have the potential to affect a single program or family of SRMs; three of these are from foreign suppliers.

EVALUATION OF THE COST AND SCHEDULE IMPACTS OF VARIOUS CONSOLIDATION SCENARIOS

IDA evaluated the following scenarios:

1. The current industrial base: Aerojet at Sacramento and ATK at Promontory and Bacchus, Utah

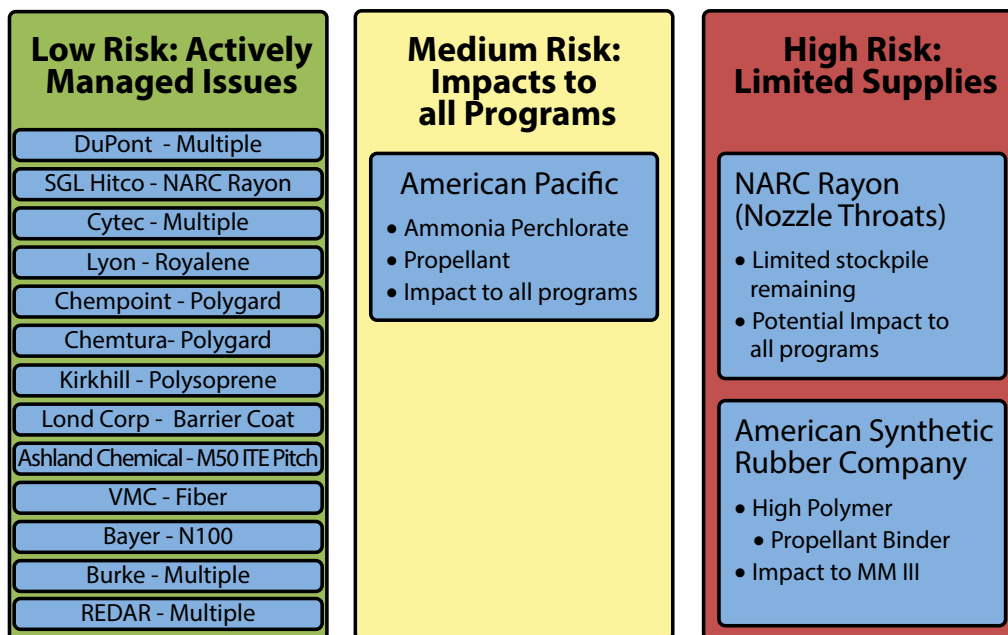


Figure 3. Actively Managed Supplier Issues

	Company	Material	Sole Source / Single Manufacturer	Domestic or Foreign
Impact to Multiple Programs / Families	Toyal America, Inc.	Spherical Alum. (X-86)	Single	US
	Sartomer	HTPB Polymer	Single	US
	Reinhold Industries	Phenolic components, molded & nozzles	Single	US
	Henkel Aerospace	Epoxy adhesives	Single	US
	Parker Hannifin CSS	Seals, gaskets	Single	US
	Arrowhead Products	Tank and Bladder	Single	US
	General Plastics	Sliver Insulation	Single	US
	Boulder Scientific Company	TPB	Sole Source	US
	Fiber Material Inc. (FMI)	ITE, C-C	Sole Source	US
	3M	HX-752	Sole Source	US
	Toral, Toho, Hexcel	Graphite Fiber		FOREIGN
	ENKA	Rayon	Sole Source	FOREIGN
	Cognis Specialty Chemical	(PEG)4500 - Motor; DDS - Igniter	Sole Source	FOREIGN
	Yong San Chemical	MA (precursor to MNA stabilizer)	Sole Source	FOREIGN
Impact to Single Program / Families	R.E. Darling	Insulation	Single	US
	Energy Research & Generation	Nozzle Baffle	Single	US
	Dongin Chemicals	2 NDPA and MNA	Sole Source	FOREIGN
	Hagedorn NC	NC	Sole Source	FOREIGN
	Heroux-Devtek	Bracket	Sole Source	FOREIGN
	Emerald Performance	HC (CTPB) Polymer	Sole Source	US
	Talley Defense System	Gas Generator	Sole Source	US

Figure 4. Potential Supplier Risk

2. Aerojet with a consolidated ATK: Aerojet at Sacramento and ATK at Bacchus with a Promontory test facility
3. ATK monopoly: ATK at Bacchus with a Promontory test facility
4. Green field government facility with contractor operators; all other sites are closed.

To evaluate the cost and schedule impacts of consolidation scenarios, the research team first had to understand the cost drivers and demand from commercial, foreign, and U.S. government entities. Next, we had to determine the total cost of the industry. After receiving data and reports from the contractors involved and various government agencies, we developed statistical relationships and found analogies or other analyses to enable estimates of total large-SRM industry costs under the scenarios listed above. Two categories of costs were considered for our estimates of these scenarios: near-term transition costs and long-term total plant costs.

The following near-term transition costs were calculated based on actual historical costs and analogies combined with IDA-derived cost models:

- Buy-out: The cost to buy out a contractor
- Close-out: The costs to close a facility or site
- Requalification: The costs to retest and requalify SRMs after a change in material, production process, etc.
- Facilities, tooling, and training.

The long-term total plant costs were:

- Direct material and direct labor
- Overhead
- Fee
- Environmental liabilities.

We first calculated the total cost of Scenario 1, the current industrial base, which was approximately \$1.2 billion per year at the time of this analysis. Next, we developed cost models to evaluate SRM industry costs relative to this baseline that were consistent with the consolidation scenario. In addition, we performed risk analyses to determine upper and lower bounds of costs, savings, and schedule impacts. The results of these scenarios are illustrated in Figure 5 and Figure 6.

Of the consolidation scenarios evaluated, only Scenario 2 (Aerojet with a consolidated ATK) made fiscal sense. Internal consolidation at ATK, as defined in this analysis, had a near-term cost between \$500 million and \$800 million and a three-year production gap; it is likely that these costs will be recovered prior to 2035, saving the taxpayer between \$0.1 billion and \$1 billion. Neither the ATK monopoly scenario (Scenario 3) nor the green field government-owned, contractor-operated (GOCO) consolidation scenario (Scenario 4) made fiscal sense. The ATK monopoly and green field GOCO scenarios have considerable near-term transition costs of \$1.4 billion to \$6.1 billion over three to nine years as well as a three- to nine-year production gap. In addition, for both of these scenarios, it is unlikely that these costs will be recovered prior to 2035.

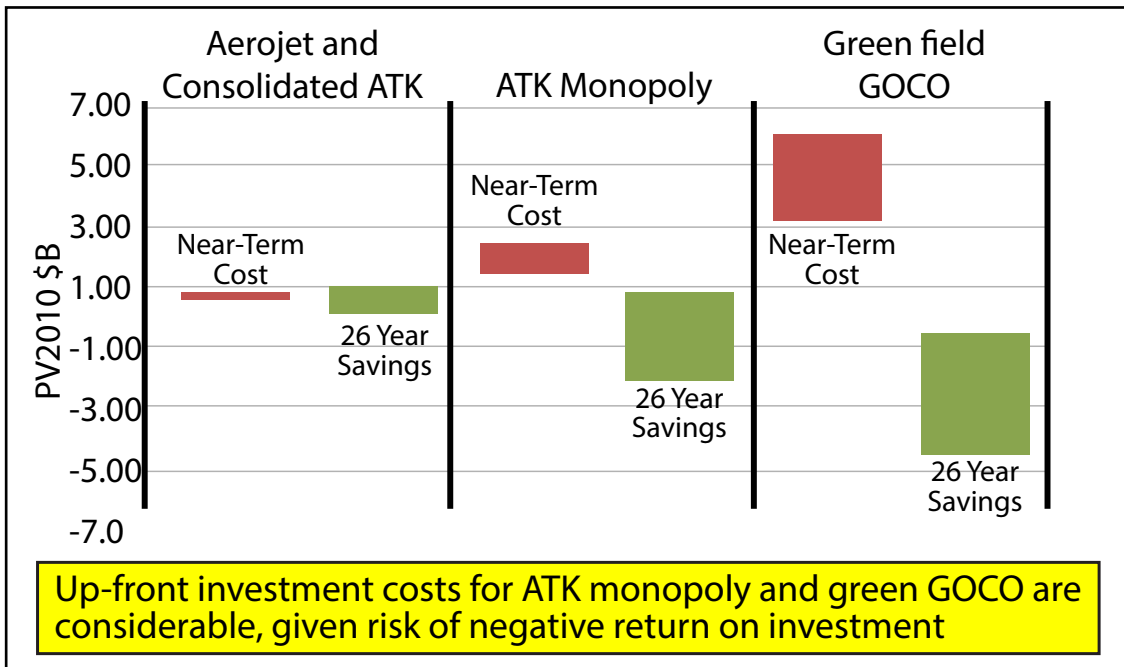


Figure 5. DoD Investment and Net Savings: 2010–2035

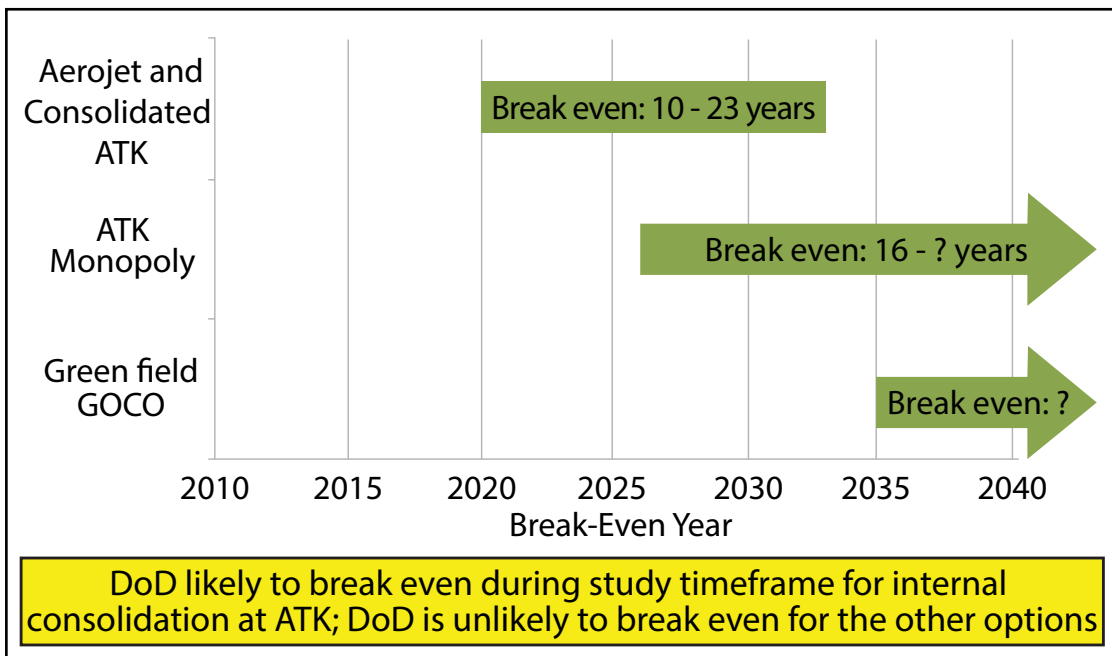


Figure 6. DoD Break-Even Time Frames

CONCLUSIONS

IDA determined that internal consolidation at ATK made the most financial sense, while the significant near-term costs, coupled with ineffective savings, made the ATK monopoly and green field GOCO options unattractive.

In addition, our analysis anticipates that the large-SRM producers and subtier suppliers would likely survive. DoD proceeded with the desire to move toward Scenario 2 (Aerojet with a consolidated ATK), and encouraged ATK to consolidate its operations.

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