

September 26, 2008

Ms. Karen Gunderson
Aerojet
P.O. Box 13222
Sacramento, CA 95813-6000

Subject: Request for additional information to respond to Aerojet's comments on Rule 456, Aerospace Assembly and Component Coating Operations

Dear Ms. Gunderson,

Aerojet has expressed concerns regarding the proposed amendments to Rule 456, Aerospace Assembly and Component Coating Operations in comment letters dated May 19, 2008, September 22, 2008, and in testimony presented at the public hearing on September 25, 2008. In order for Staff to properly respond to Aerojet's concerns, I am requesting that Aerojet provide the following information:

1. A more detailed description of Aerojet's unique operation in manufacturing solid propellant rocket motors and of the financial impact of adopting the proposed rule changes to reduce the exemption level for noncompliant materials. In the description, please also include the reason why Aerojet will have to shut down the programs using FM-47 adhesive during a qualification period for replacement adhesives, rather than operating at lower production levels.
2. List all contracts or expected contracts that require the use of FM-47 adhesive, and note whether the rockets/missiles are designed travel beyond the Earth's atmosphere. Also include copies of contracts and/or specifications.
3. A list of other liner adhesive materials used by Aerojet and an explanation of whether Aerojet has investigated these materials as potential replacements for FM-47.
4. Specifics about Aerojet's investigation into replacement products for FM-47 and alternative solvents for the cleaning of coating application equipment used in lining operations, including products tested and problems encountered.
5. The total usage, in gallons, of FM-47 adhesive for the past two years, broken down by program (e.g., SM-1, HAWK).
6. The projected usage, in gallons, of FM-47 adhesive, broken down by program, including existing and potential contracts.
7. The product name, VOC content, and product data sheets for each solvent used to clean the coating application equipment used in lining operations.
8. The total usage of each solvent used for the cleaning of coating application equipment used in lining operations for the past two years.

Ms. Karen Gunderson
September 26, 2008

9. The total projected usage of each solvent used for the cleaning of coating application equipment used in lining operations.
10. The estimated total cost to requalify each solvent used for the cleaning of coating application equipment used in lining operations.
11. Describe the environmental/health issues and cost impact of using alternative solvents as described by Aerojet's Fire Marshall at the September hearing. We are aware that Aerojet already uses many of these exempt solvents (acetone, methylene chloride, etc.). Please identify any additional costs or other obstacles to increased use of these products. Include the costs to modify building ventilation systems, solvent storage areas, and building reclassification.

Please submit the requested information to me as soon as possible but no later than October 3, 2008. Staff will evaluate the information and modify the proposed rule, if appropriate. We would like to meet with you to discuss the additional information no later than October 6, 2008. Please contact me to arrange a meeting time. Staff plans to take the proposed rule back to the board for consideration on October 23, 2008. If you have any questions or comments, please contact me at (916) 874-4851. Thank you.

Sincerely,



Kevin J. Williams, Ph.D.
Program Coordinator

c: Chelsea Sand



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Sacramento CA 95813-6000
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October 3, 2008
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Mr. Kevin J Williams
Sacramento Metropolitan Air Quality Management District
777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Subject: Submittal of Additional Information as Requested by SMAQMD Regarding Proposed Changes to Rule 456, Aerospace Assembly and Component Coating Operations

Dear Mr. Williams:

Aerojet appreciates the Air District's efforts to work out a solution regarding the changes to Rule 456. As we discussed at the Board Meeting on September 25, 2008 the changes will have a negative impact on Aerojet's rocket motor and propulsion subsystem production programs and therefore may impact on the defense of our nation and our allies. Below is Aerojet's response to the questions you posed in your letter to me dated September 26, 2008. I look forward to meeting with you on Monday, October 6.

SMAQMD Question 1. A more detailed description of Aerojet's unique operation in manufacturing solid propellant rocket motors and other financial impact of adopting the proposed rule changes to reduce the exemption level for non compliant materials. In the description, please also include the reason why Aerojet will have to shut down the programs using FM-47 adhesive during a qualification period for replacement adhesives, rather than operating at lower production levels.

Aerojet Response 1. Aerojet is one of two solid rocket motor manufacturers in the United States. As such Aerojet is in a strategic position for the Department of Defense, national security, NASA, and other commercial applications. The manufacture of solid rocket motors involves taking a casing (which may be metal or a composite) and filling it with propellant. Prior to filling the casing with a propellant, the casing must be "lined" with a material and in some cases the "liner" material will not adhere to the casing and therefore an adhesive must be used. This is the case with Standard Missile and Hawk where the FM 47 adhesive must be used. The use of the FM-47 lining material is not under the direct control of Aerojet in the applications to the process for manufacturing of rocket motors. The customer's technical data package or drawings tell us what to manufacture for the Department of Defense (DoD) items. And they most often specify the critical processes that must be followed and material that must be used when building the motor. Any changes to the build plan must be approved prior to implementation. The customer will also specify what testing that must be accomplished to ensure that any material change is satisfactory and does not affect the motor performance in any way. In the majority of major internal changes, the customer will require us to build and test at the environmental temperature limits, which includes testing up to four rocket motors. This qualification program provides data to them that the new material provides no adverse affect on the motors performance.

The use of the FM-47 lining material is not under the direct control of Aerojet in the applications to the process for manufacturing of rocket motors. The customer's technical data package or drawings tell us what to manufacture for the Department of Defense (DoD) items. And they most often specify the critical processes that must be followed and material that must be used when building the motor. Aerojet is currently in production on the Standard Missile #1 (SM-1) boost/sustain rocket motor. Standard Missile #1 is a Navy program that provides shipboard self defense. This system is used by 17 nations around the world. If the Sacramento Metropolitan Air Quality Management District's (SMAQMD) proposed change for the low usage exemption goes into place in January 2009, Aerojet will have to shut the program down while we attempt to find a suitable replacement for the FM-47 adhesive used to bond the insulation to the motor case. Of course, under the active contract this activity will not be an allowable contract charge and therefore must be borne by Aerojet. IF we find a suitable replacement for Standard Missile #1, then Aerojet will have to qualify the product in accordance with US Navy standards which is estimated to cost between \$500,000 to \$720,000, depending on the number of motors required to be test fired, and take a minimum of 7 months. **Attachment 1** contains the cost breakdown for FM-47 replacement. Due to our contractual delivery rate, Aerojet cannot slow down and operate at a lower production rate, and it is impractical to test new materials and produce hardware while using the same lining machine. This non-productive time will cause a reduction to our workforce by about 30 people and consequently Aerojet will suffer about a \$27 million dollar loss in revenue in 2009. (Kevin's spreadsheet shows 43 jobs and 35M lost revenue.) shown in **Attachment 2**. If we can't find a suitable replacement, or the customer determines that for the sake of defense of the ships afloat worldwide they desperately need these motors, the only other place they can be produced is in Japan. If that happens we are facing a huge loss in revenue in the long run due to the loss of the follow-on SM-1 contracts. This worst case scenario gives you a very good idea of what we are facing.

Additionally, Aerojet is in the process of being awarded another production contract that is similar in many ways to the Standard Missile #1 program and uses the same FM-47 liner material. This system is for the US Army Air Defense Center and is called the HAWK system. The HAWK system is used by 47 countries throughout the world for local air defense and Aerojet is the sole US producer of the rocket motor for export. Again, a similar impact story if a suitable replacement can not be found. Aerojet estimates the cost to requalify the FM47 liner for the HAWK program, in accordance with US Army standards, at \$5 million dollars (Kevin's spreadsheet shows 10M). Attachment 2 outlines the cost of HAWK as well as SM-1. Since this contract will be awarded in October, the estimate includes costs for requalify at another facility, which includes all steps associated with HAWK production, i.e. grinding and mixing propellant, cast and final assembly. Again, a conservative production down time is estimated at 7 months, a reduction in workforce, and a loss of revenue of approximately \$20 million dollars (Kevin has \$40M) once the contract is finalized. This contract has a required delivery rate as well and production cannot slow down or take place during a requalification period.

SMAQMD Question 2. List all contracts or expected contracts that require the use of FM-47 adhesive and note whether the rockets/missile are designed travel beyond the Earth's atmosphere. Also include copies of contracts and/or specifications.

Aerojet Response 2. There are two programs that use the FM-47 adhesive material, SM-1 and HAWK. Neither programs are considered space vehicle (designed to travel beyond the Earth's atmosphere) and are classified as aerospace components as defined by SMAQMD Rule 456 Aerospace Assembly and Component Coating Operations dated July 23, 1998.

The list of current contracts are:

- 1) SM-1 Mk-56 DTRM Regrain - 4200007575 (567 units)
- 2) SM-1 Mk-56 DTRM Regrain - 4200043046 (481 units)

Anticipated Contracts include:

- 1) Request for Proposal SM-1 Mk-56 DTRM Regrains – Request for Quotation (RFQ) 5LO-ABB-1052/6000028793 (200 to 600 units)
- 2) HAWK - Solicitation No. W31P4Q-08-R-0303 or Req/PO # RFH06408 – award expected October 2008 (482 units)
- 3) HAWK - Inquiry from US Army Aviation & Missile Command (up to 1200 units)

Attachment 3 includes copies of Purchase Orders and RFQs. This information is not included in the package but rather will be hand delivered on Monday October 6, 2008 and in accordance with DoD Directive 5230.25 cannot be left at the SMAQMD offices. The specification that calls out FM-47 is WS-4523

SMAQMD Question 3. A list of other liner adhesive materials used by Aerojet and an explanation of whether Aerojet has investigated these materials as potential replacements for FM-47.

Aerojet Response 3. In addition to FM-47 used on the Standard Missile and Hawk program, THAAD uses Chemlock TS-3320-19 or Chemlock Z45 which are the liner adhesive materials used on THAAD cases. The Material Safety Data Sheets (MSDS) for the Chemlocks were provided to you via email on September 24, 2008. To date Aerojet has not investigated Chemlocks for the SM or HAWK programs because we've had the low usage exemption in Rule 456 and the costs of requalification and potential program shut down.

Please note that some of the MSDS's provided to you on September 24th, 2008 SD956 and SD746 are not liner adhesive materials but are the actual liner itself. SD956 is used on the Atlas cases and SD746 is used on the SM-1 and Hawk cases. Both SD956 and SD746 are Rule 456 compliant materials.

SMAQMD Question 4. Specifics about Aerojet's investigation into replacement products for FM-47 and alternative solvents for the cleaning of coating application equipment used in lining operations, including products tested and problems encountered.

Aerojet Response 4. On September 17, 1991, Aerojet prepared and approved an Engineering Qualification Test Plan, 268-QP-107, to evaluate three candidate replacements for FM-47. The candidates were E-2062 by BF Goodrich, W-19 by Emerson & Cuming, and Magnobond 720 by Magnolia Plastics. This plan was approved by the US Navy. However, the plan was not carried out because SMAQMD approved the Rule 456 low usage exemption and the limited use of FM-47 was allowed.

The 1991 test plan 268-QP-107, if conducted today as planned and if the listed materials are still available for procurement, would cost about \$947K today. Aerojet would propose to the Navy today a modification to the 1991 test plan to reduce the number of test motors from 4 to and to eliminate the need for 2 motor chambers to be destructively tested. If approved by the Navy it could lower the costs of the test plan by \$230K. **Attachment 4** includes a copy of the 1991 Engineering Qualification Test Plan 268-QP-107. . This information is not included in the package but rather will be hand delivered on

Monday October 6, 2008 and in accordance with DoD Directive 5230.25 cannot be left at the SMAQMD offices.

With regard to alternative solvents for cleaning of lining equipment, as part of the Green Team activity around the late 1990s, Aerojet conducted experiments with acetone, ethyl acetate, methyl acetate, isopropanol, Glidsafe, UT-4SB, various fluorinerts and some other possible chemicals. These solvents were tried in the Burning Rate lab (for clean up of propellants and liners). Results for propellants and liners that are petroleum based products (large chain polymers as the binder), acetone and methyl acetate were ineffective for cleaning as they are only partially miscible. There was also a safety concern due to low flash points.

Ethyl acetate and isopropanol were slightly more effective but still much too polar. Glidsafe and UT-4SB and the chlorofluorocarbons were effective cleaning solvents.

Silicone-based cleaning solvents were also considered. However, the real problem with these is the tendency of silicone to impede bonding in propellants, liners and adhesive systems. Aerojet uses RTVs and various silicone greases as release agents to specifically prevent bonding. A silicone based solvent would have the high likelihood of causing an unbond in a rocket motor that would lead to scrapping it or, in the worst case, a catastrophic burn through and failure of mission. Silicone is excluded from liners and propellants at all times and only cured RTVs are used in the presence of propellants. OS-10 would have the distinct possibility of contaminating all liners due to material being left on the internal surfaces or cavities of lining machines, piping, etc.

SMAQMD Question 5. The total usage, in gallons, of FM-47 adhesive for the past two years, broken down by program (e.g., SM-1, HAWK).

Aerojet Response 5. The SM-1 program has used approximately 20 gallons of FM47 adhesive in 2007 and 20 gallons in 2006. These numbers may appear to be significantly less than the low usage volume exemption amount of 200gal/year. Aerojet recently restarted the SM-1 production mid year in 2006 and 2007 was plagued with production delays so the 40 gallon total is not a good representation of how much FM47 adhesive will be required when in full production.. Also the HAWK program over the past two years was not in production so therefore no FM47 adhesive was used on this program.

Aerojet has ever changing program requirements and it is sometimes very difficult to predict when certain programs will be in production or when they will be delayed or cancelled. In Aerojet's response to question 6 we tried to predict usage of FM-47 over the next few years.

SMAQMD Question 6. The projected usage, in gallons, of FM-47 adhesive, broken down by program, including existing and potential contracts.

Aerojet Response 6.

Contract	Total FM-47 usage, gallons	Projected Annual Usage, 2009	Projected Annual Usage 2010	Projected Annual Usage 2011
SM-1 Regrain 4200007575 (567 units)	35.4 Note: 15.4 is anticipated use in 2008.	20		
SM-1 Regrain 4200043046 (481 units)	30.0	30		
SM-1 RFQ 5LO-ABB- 1052/6000028793 (up to 600 units)	37.4	15	22.4	
HAWK – (482 units) – Solicitation No. W31P4Q-08-R-0303 or Req/PO # RFH06408	30.0	10	20	
HAWK – (up to 1200 units)	74.9		30	44.9
Future SM-1 and HAWK buys	15 +			15+
FM-47 usage for process proofing, equipment replacement checkout	15	5	5	5
Total FM-47 usage	237.7 +	80	77.4	64.9 +

Attachment 5 details the above calculations.

In addition to FM47 adhesive, Aerojet uses the Low Usage Exemption category for additional adhesives used on non-space vehicle components. The last two years of Low Usage Exemption Tracking reports sent to the SMAQMD show usage of Chemlock and Scotch-Weld adhesives.

Aerojet would like the air district to keep in mind again that Aerojet’s production goes up and down and is not a constant number from year to year. So the low usage exempt category should remain at 200 gallons per year to accommodate FM47 adhesive usage as well as other small uses.

SMAQMD Question 7. The product name, VOC content, and product data sheets for each solvent used to clean the coating application equipment used in lining operations.

Aerojet Response 7. See **Attachment 6** for Aerojet’s current liner and solvent MSDS’s listing. Copies of the MSDSs were provided to you via email on September 24, 2008.

SMAQMD Question 8. The total usage of each solvent used for the cleaning of coating application equipment used in lining operations for the past two years.

Aerojet Response 8. See Attachment 6.

SMAQMD Question 9. The total projected usage of each solvent used for the cleaning of coating application equipment used in lining operations.

Aerojet Response 9. See Attachment 6.

In Attachment 6, the projected solvent usage is for 2009 only.

SMAQMD Question 10. The estimated total cost to requalify each solvent used for the cleaning of coating application equipment used in lining operations.

Aerojet Response 10. The cost to requalify one cleaning solvent is approximately \$250,000 dollars. The details for this calculation are show in **Attachment 7**. Aerojet has 6 adhesive/liner cleaning solvents that would need to be replaced, resulting in an approximate \$1.5 million dollar setback. One other program that use solvents for liner equipment cleaning and will be affected by the SMAQMD changes include the Theater High Altitude Area Defense (THAAD) Missile defense system. This is the nation's newest missile defense system and is in production now with a very high Department of Defense priority rating. Another system impacted is the nation's only deployed missile defense system the Ground Based Midcourse Defense System (EKV), deployed in Alaska and Vandenberg Air Force Base and soon to be deployed to Europe. Another systems impacted are the Standard Missile 2 & 3 systems which is used for air and missile defense of the US Navy fleet. As you may recall reading in the papers or seeing the news reports, it was recently used to shoot down the falling satellite. Another system that would be impacted is the Atlas program. Atlas is Lockheed Martin's newest and most powerful launch vehicle and uses the world's longest monolithic filament-wound carbon composite case. All of these programs will be negatively impacted.

SMAQMD Question 11. Describe the environmental/health issues and cost impact of using alternative solvents as described by Aerojet's Fire Marshall at the September hearing. We are aware that Aerojet already uses many of these exempt solvents (acetone, methylene chloride, etc.). Please identify and additional costs or other obstacles to increased use of these products. Include the costs to modify building ventilation systems, solvent storage areas, and building reclassification.

Aerojet Response 11. Aerojet does not use many of the solvents on SMAQMD's Rule 201 exempt solvent list for a number of reasons including flammability and/or worker safety. Two chemicals on the exempt list acetone and methylene chloride are used in very small quantities and as in the case of methylene chloride (a carcinogen) is restricted to lab operations only. Most of other listed exempt materials are prohibited or restricted for use at Aerojet as they are ozone depleting substances, on the EPA 17 list, hazardous air pollutants, or known/potential carcinogens. At the September 25th board meeting, Greg Granados (Aerojet's Fire Marshall) explained the concerns regarding the use of acetone. Acetone may be a good solvent to use as a replacement in some situations but the flammability of the solvent creates another serious hazard. It is a class 1B flammable liquid with

a flash point of -4 F ° and boiling point of 133 F ° with an explosive range of 2.6 to 12.8 %. It is a serious flash fire hazard due to its vapor density of 2 and ability to travel significant distance to an ignition source. As a polar solvent, it is highly prone to electrostatic discharge and ignition from spark. The California Electrical Code requires Class 1 Division 1 D electrical equipment and wiring for atmosphere with acetone vapors present. The cost difference is about 5 time more expensive for the fitting and outlet boxes for Class I wiring.

The Aerojet production buildings have been specifically designed for the processes now in place. Changes in the cleaning products will require changes in electrical equipment and wiring, changes in ventilation rates and mechanical systems, and the installation of physical barriers such as walls and or booths to allow the use of different cleaners. This will also require segregated of operations and re-location to other buildings to allow their uses. There are significant cost associated these facilities changes. The fire code allows only 60 gallons of a flammable liquid in storage at one time. Only 30 gallons can be in open systems such as the spray cleaning operation in any one control area. Aerojet would have to stop other operations which use listed and approved products to do this type of cleaning and stay with in regulations. Aerojet is allowed only 4 control areas in our buildings. We already are using this exception for our productions. If we are required to move these operations, there is the cost of relocation and the new wiring and ventilation system with any new building. New buildings are roughly 350 dollars per square foot. Occupancy separations in existing buildings require modification wiring system and new air handlers and ductwork. The cost of construction for existing buildings are variable but can run higher than new buildings and as low at 150 dollars per square foot.

Ventilation changes for methylene chloride use are roughly \$5,000 to \$15,000 for an air handling unit and \$2,000 to \$10,000 dollars for ductwork and filtration These costs do not include the Industrial Hygiene costs for employee monitoring nor medical costs for a medical surveillance program.

A change of chemical to a product like acetone or methylene chloride will serious financial impact our facility and increase the threat of fire on this site. Acetone is far more flammable and requires facility modifications.

In conclusion, Aerojet has been unsuccessful to date in finding an adequate replacement and we would like to keep our current non-compliant limit on the amount of FM-47 to be used at 200 gallons per year. In addition, Aerojet requests an exemption for cleaning adhesive application equipment or retain the ability to use enclosed gun cleaners as a way to comply with capturing air emissions, I would also encourage the Air District to focus on air emissions from the use of the adhesives and solvents rather than simply usage. Usage just assumes that everything we use goes up into the air which is clearly not the case. I look forward to our meeting Monday where we can discuss this matter further.

If you have any questions, please contact Chelsea Sand at (916) 355-2971 or Karen Gunderson at (916) 355-2387.

Thank you,



Karen Gunderson
Director, Environmental, Health and Safety

Attachments

ATTACHMENT 1

ROM Costs for FM-47 Replacement Requal, 2 Motors

Task	SH	HH	ODC	Materials	Cost
Write test plan	40				\$ 7,600.00
Test Plan Approval Aerojet	24				\$ 4,560.00
Test Plan Approval by customer	16				\$ 3,040.00
Test Plan Approval by DoD	16				\$ 3,040.00
Procurement of Candidate Adhesives	20			\$ 1,000.00	\$ 4,800.00
Cut up of motor chamber for samples	16	60		\$ 20,000.00	\$ 32,040.00
Preparation of liner and metal samples	60	60			\$ 20,400.00
Aging of subscale samples	48	48			\$ 16,320.00
Testing of subscale samples	160	160			\$ 54,400.00
Selection of 1 candidate adhesive	8				\$ 1,520.00
					\$ -
Prepare planning for live propellant samples	32				\$ 6,080.00
Process Safety Management reviews	40	16			\$ 10,000.00
Preparation of 2 motor chambers	16	16		\$ 40,000.00	\$ 45,440.00
Adhesive sample application to chambers	8	16			\$ 3,920.00
Lining of 2 chambers	8	16		\$ 500.00	\$ 4,420.00
Propellant mixing, casting for 2 booster grains	60	120		\$ 10,000.00	\$ 39,400.00
Propellant mixing, casting for 2 sustainer grains	60	120		\$ 10,000.00	\$ 39,400.00
Final Assembly	40	160		\$ 10,000.00	\$ 41,600.00
Aging of motors - 3 months	96	96			\$ 32,640.00
Xray	16	16			\$ 5,440.00
Test fire of motor hot	60	60			\$ 20,400.00
Test fire of motor cold	60	60			\$ 20,400.00
Analysis of data - CONFIDENTIAL	24				\$ 4,560.00
Final Report	80				\$ 15,200.00
Drawing Changes for new adhesive	48				\$ 9,120.00
Planning Changes for new adhesive	40				\$ 7,600.00
Waste disposal - excess propellant, motor case	24	32		\$ 25,000.00	\$ 34,360.00
	1120	1056	0	\$ 116,500.00	
Costs	\$ 212,800.00	\$ 158,400.00		\$ 116,500.00	\$ 487,700.00
	\$ 190.00	\$ 150.00			

ROM Costs for FM-47 Replacement Requal, 2 Motors

Task	SH	HH	ODC	Materials	Cost
Write test plan	40				\$ 7,600.00
Test Plan Approval Aerojet	24				\$ 4,560.00
Test Plan Approval by customer	16				\$ 3,040.00
Test Plan Approval by DoD	16				\$ 3,040.00
Procurement of Candidate Adhesives	20			\$ 1,000.00	\$ 4,800.00
Cut up of motor chamber for samples	16	60		\$ 20,000.00	\$ 32,040.00
Preparation of liner and metal samples	60	60			\$ 20,400.00
Aging of subscale samples	48	48			\$ 16,320.00
Testing of subscale samples	160	160			\$ 54,400.00
Selection of 1 candidate adhesive	8				\$ 1,520.00
Prepare planning for live propellant samples	32				\$ -
Process Safety Management reviews	40	16			\$ 6,080.00
Preparation of 4 motor chambers	32	32		\$ 80,000.00	\$ 90,880.00
Adhesive sample application to chambers	16	32			\$ 7,840.00
Lining of 4 chambers	16	32		\$ 500.00	\$ 8,340.00
Propellant mixing, casting for 4 booster grains	60	120		\$ 35,000.00	\$ 64,400.00
Propellant mixing, casting for 4 sustainer grains	60	120		\$ 35,000.00	\$ 64,400.00
Final Assembly	80	320		\$ 20,000.00	\$ 83,200.00
Aging of motors - 3 months	96	96			\$ 32,640.00
Xray	32	32			\$ 10,880.00
Test fire of motor hot	120	120			\$ 40,800.00
Test fire of motor cold	120	120			\$ 40,800.00
Analysis of data - CONFIDENTIAL	48				\$ 9,120.00
Final Report	80				\$ 15,200.00
Drawing Changes for new adhesive	48				\$ 9,120.00
Planning Changes for new adhesive	40				\$ 7,600.00
Waste disposal - excess propellant, motor case	48	64		\$ 50,000.00	\$ 68,720.00
	1376	1432	0	\$ 241,500.00	
Costs	\$261,440.00	\$ 214,800.00		\$ 241,500.00	\$ 717,740.00
	\$ 190.00	\$ 150.00			

ATTACHMENT 2

Program	Process Affected	2009 Value	2009 Jobs Lost	2010 Value	2010 Jobs Lost	2011 Value	2011 Jobs Lost	2012 Value	2012 Jobs Lost	Requal Costs \$K	Requal Delay Months	Notes
Standard Missile, Mk 55 - Current Contract	FM-47, spray gun cleaner	\$30M	35	\$12M	15	\$20M	30	\$10M	30	\$ 487,700.00	7	Current Contract - under contract with US Govt
	FM-47, spray gun cleaner	\$5M	8	\$15M	20	\$20M	30	\$10M	30		7	
Standard Missile, Mk 55 - Option	FM-47, spray gun cleaner	\$10M	15	\$20M	30	\$10M	20			\$ 487,700.00	7	
HAWK												
		\$45M	58	\$47M	65	\$30M	50	\$10M	30	\$ 975,400.00		

Current SM1 Contract is with the DoD and Aerojet is under contractual obligation to complete. Movement out of state would require a requalification effort for the complete program and this has been estimated at \$4M.

Aerojet would lose the SM1 Option

Aerojet would not be able to perform HAWK in Sacramento. Relocation to Camden would require requalification costs of \$3.7M

ATTACHMENT 3

Attachment 3

Attachment 3 includes copies of Purchase Orders and RFQs. This information is not included in the package but rather will be hand delivered on Monday October 6, 2008 and in accordance with DoD Directive 5230.25 cannot be left at the SMAQMD offices

ATTACHMENT 4

Attachment 4

Attachment 4 includes a copy of the 1991 Engineering Qualification Test Plan 268-QP-107. . This information is not included in the package but rather will be hand delivered on Monday October 6, 2008 and in accordance with DoD Directive 5230.25 cannot be left at the SMAQMD offices.

ATTACHMENT 5

Attachment # 5

Subject: FM-47 adhesive usage for SM-1 and HAWK programs

Date: 9/29/08

Prepared by: Kevin Smith

2.8 liters / 16 chambers * 0.2642 gallons / liter = 0.0462 gal / chamber

Allow:

10% for re-doing (mistakes, production errors, human error, time limitations)

25% for setup/equipment problems, cleanups

0.0462 gallon / chamber * 1.35 = **0.0624 gallon / chamber**

SM-1

567 chambers * 0.0624 gallon / chamber = 35.4 gallon

481 chambers * 0.0624 gallon / chamber = 30.02 gallon

600 chambers * 0.0624 gallon / chamber = 37.45 gallon

HAWK

482 chambers * 0.0624 gallon / chamber = 30.09 gallon

1200 chambers * 0.0624 gallon / chamber = 74.9 gallon

Approximately 5 gallon / year for equipment change out, refurbishments.

ATTACHMENT 6

Program	Location	Operation	Coating/Material (MSDS #)	Historical Use (gallon) (10/1/06 - 10/1/08)	Projected Use (gallon) (2009)	Coating Manufacturer	Current Clean-up Material (MSDS #)	Historical Use (gallon) (10/1/06 - 10/1/08)	Projected Use (gallon) (2009)
SM	20004	Adhesive Application	FM-47 Adhesive (M00091) VOC's = 763 g/l (3 parts adhesive, 2 parts thinner)	40	70	Cytec	FM-47 Thinner (M00091A) VOC's = 880 g/l (pure thinner)	55	17.75
SM	20004	Liner Application	SD746 liner (M10377)	n/a, compliant material	n/a, compliant material	Aerojet	Gildsafe (M11830) Density = 7.26 lb/gal, VP = 4.5 mm Hg@20	292	240
HAWK	20004	Adhesive Application	FM-47 Adhesive (M00091) VOC's = 763 g/l (3 parts adhesive, 2 parts thinner)	0	10	Cytec	FM-47 Thinner (M00091A) VOC's = 880 g/l (pure thinner)	0	17.75
HAWK	20004	Liner Application	SD746 liner (M10377)	n/a, compliant material	n/a, compliant material	Aerojet	Gildsafe (M11830) Density = 7.26 lb/gal, VP = 4.5 mm Hg@20	0	240
Atlas	01007	Liner Application	SD956 liner (M10382)	n/a, compliant material	n/a, compliant material	Aerojet	Gildsafe (M11830) Density = 7.26 lb/gal, VP = 4.5 mm Hg@20	82.5	7.5
Atlas	04025	Inhibitor Application	SD956 liner (M10382)	n/a, compliant material	55	Aerojet	PF-HP (M11150) VOC's = 860 g/l, VP = 1.1 mm Hg@20	0	12.5
THAAD	01083	Chamber Lining	Chemlock TS-3320-19 (M14356) VOC's = 770 g/l	n/a, compliant material	n/a, compliant material	Lord Corporation	DS-108 (M11829) VOC's = 950 g/l, VP = 1.1 mm Hg@20	5	5
			Chemlock Z451/Z004/9956 (M14357) VOC's = 517g/l	n/a, compliant material	n/a, compliant material		DS-108 (M11829) VOC's = 950 g/l, VP = 1.1 mm Hg@20	5	5

ATTACHMENT 7

Cost for Requalification of a Liner Cleaning Solvent

Task	SH	HH	ODC	Materials	Cost
Write test plan	40				\$ 7,600.00 Shorter test plan than hot fire
Test Plan Approval Aerojet	16				\$ 3,040.00
Test Plan Approval by customer	16				\$ 3,040.00
Test Plan Approval by DoD	16				\$ 3,040.00
Procurement of Candidate solvents	20			\$ 1,000.00	\$ 4,800.00 Candidate materials
Screen candidate solvents for effectiveness	32	16			\$ 8,480.00
Fabrication of composite panels	40	80		\$ 5,000.00	\$ 24,600.00
Cut up of motor chamber for samples	16	60		\$ 50,000.00	\$ 62,040.00 1 chamber
Preparation of liner and metal samples	60	60			\$ 20,400.00 120 samples
Aging of subscale samples	48	48			\$ 16,320.00 6 weeks
Testing of subscale samples	120	120			\$ 40,800.00 Samples are inert
Selection of 1 candidate solvent	8				\$ 1,520.00
Full scale trials of cleaning of lining machine	40	40		\$ 2,000.00	\$ 15,600.00 solvent + liner used
Final Report	64				\$ 12,160.00
Drawing Changes for new solvent	48				\$ 9,120.00
Planning Changes for new solvent	40				\$ 7,600.00
Waste disposal - waste solvent, motor case	8	8		\$ 1,000.00	\$ 3,720.00
	632	432	0	\$ 59,000.00	
Costs	\$ 120,080.00	\$ 64,800.00		\$ 59,000.00	\$ 243,880.00
	\$ 190.00	\$ 150.00			

Composite case or program asset used