~~CONFIDENTIAL~~

LIVERMORE LAWRENCE RADIATION LABORATORY
ROOM: BLDG.

729706

July 14, 1960

WBR

R

TO: W. B. REYNOLDS

SUBJECT: Subcontract 144
Aerojet-General Corporation

Attached for your approval and transmission to the University and the AEC is the First Amendment to this subcontract extending the term only an additional two months. This extension will cover work performance under a revised First Addendum to Appendix A authorized April 15, 1960. AGC's proposal covering this revised requirement has been reviewed and approved by Drs. Godfrey, Dorough and Cady. Basis for the revision is contained in the April 26, 1960 memo of Dr. Godfrey, copy attached. A copy of AGC's proposal of May 26, 1960 is also attached for your review.

BEST COPY AVAILABLE

C. L. BLUE

CLB:NEC:m
Attached
cc: W. D. Douglass, w/att

Classification cancelled by authority of
[illegible]
(Declassification authority) (Date)
[illegible]
(Signature of person making the change) (Date)

[illegible]

CLASSIFICATION ~~CANCELLED OR~~
~~CHANGED TO~~ [illegible]
BY AUTH.
BY [illegible] DATE 9-19-95

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When separated from [illegible] this document [illegible]

UNIVERSITY OF CALIFORNIA (Letterhead for interdepartmental use)

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Declassified per M. Heidenhayer 4/28/60

C Blue / N Cady

April 26, 1960

M E M O R A N D U M

TO: C. Blue

FROM: C. Godfrey

SUBJECT: Realignment of Subcontract 144

On April 15, 1960 Gus Dorough, W. Cady and E. Wittry visited Aero Jet's Downey plant to meet with Dr. Sol Skolnik and other Aero Jet staff members to discuss the technical progress and objectives of this subcontract. The result of this meeting was to develop and agree on a realigned scope of work for Appendix A of Subcontract 144. ~~The following revisions are desired:~~

1. W Timing Chain

Eliminate all effort on the W timing chain as requested in the February 16, 1960 letter to C. Blue from E. Wittry.

2. B Timing Chain

Realign the effort on the B timing chain.

A request was made to initiate this program on May 29, 1959, COPJ 135-59; on December 7, 1959 the program was committed to Aero Jet.

LRL's explosive Chemistry group undertook the problem of modifying the DuPont EL 506 plastic bonded explosive because of programmatic requirements and the long time required for placing this contract. This program, which was performed with DuPont's complete cooperation has resulted in the development of a plastic bonded explosive, DuPont EL 506 L1 which appears generally to meet the B timing chain requirements.

It was mutually agreed, at the April 15 meeting, to curtail Aero Jet's effort on the nitro polymer approach to the timing chain problem because of the inability of this material to compete with the DuPont material. It was agreed that Aero Jet would pursue the B timing chain problem at a reduced level of effort. The objective here is to evaluate the feasibility of developing a thermal setting type material which has the same general properties as EL 506 L1 but has the added property of exhibiting smaller variations in detonation velocity as a function of temperature.

It was also decided that Aero Jet would make the following evaluation of the EL 506 L1 material:

a) Determine the detonation velocity of EL 506 L1 explosive in 1/8, 1/16, 1/32" square lucite channels at temperatures in the -65°, 70° and 165° F range.

b) Determine the detonation velocity, at approximately 70°F, of EL 506 L1 which has been temperature cycled approximately 10 times between -65° and +165° F. The rate of temperature change should not exceed 50° F/hour.

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The detonation velocity measurements are to be made to an accuracy of approximately 0.1%.

LRL will provide Aero Jet with all EL 506 L1 explosives required for this evaluation. Aero Jet will provide all other hardware.

3. Foamed Explosives

Continue the development effort on the foamed explosives as described in Addendum 1 to Appendix A of Subcontract 144.

A general satisfaction to the technical progress being made on this program was expressed by LRL's representatives during the April 15 meeting. It was requested that Aero Jet re-evaluate the feasibility of meeting the program objectives with the existing time scale and the present allocation of technical effort.

It is requested that the Business Office officially inform Aero Jet of our desires to make the above revisions to Subcontract 144 (effective April 15, 1960) and obtain from them a statement as to the new program objectives and their willingness to pursue this realigned scope of work. A statement should also be obtained from Aero Jet as to how this revised scope will effect the existing funding and time scale of the present subcontract.

C. Godfrey

CG/EW:krt

Distribution:

✓C. Blue/N. Carey
H. Brown/D. Sewell
G. Dorough/J. Kury
F. Eby
J. Foster
C. Godfrey
T. Jenkins
E. Wittry

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A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

In Reply

Refer to:
1022: Subcontract 144
WFB:jk

University of California
Lawrence Radiation Laboratory
Post Office Box 808
Livermore, California

Attention: Mr. C. L. Blue, Assistant Business Manager

Attn. wrought Downey Facility

Subject: Realignment of Scope University of California Subcontract No. 144.

Reference: (a) UCLRL letter dated 2 May 1960, same subject

Gentlemen:

Pursuant to reference (a) Aerojet-General Corporation is pleased to submit the following realignment of scope for subject program.

W Timing Chain

1. No further work will be performed on the W timing chain.

B Timing Chain

Effort will be curtailed on the development of nitropolymer explosives for the B timing chain. A low level of effort will be expended to investigate candidate thermosetting explosive compounds. Such a thermosetting compound should have the same general properties of DuPont EL 506-L1 but with less variation in thermal expansion and detonation velocity as a function of temperature.

The following evaluation of DuPont EL 506-L1 explosive strands will be made:

1. Determine the detonation velocity of EL 506-L1 explosive in 1/8, 1/16, and 1/32 inch square Lucite channels at temperature in the -65°F, 70°F and 165°F range.

2. Determine the detonation velocity at approximately 70°F, of EL 506-L1 strands which have been temperature cycled approximately 10 times between -65°F and +165°F. The rate of temperature change

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should not exceed 50°F/hour.

The detonation velocity measurements will be made as accurately as possible and should be within approximately ± 0.1%.

University of California will provide at no charge to Aerojet all EL 506-21 explosive required for this evaluation. Aerojet will provide facilities and materials necessary for extruding the explosive into strands, for maintaining specified temperatures and for making accurate velocity measurements.

Foamed Explosives

Aerojet will continue the development effort in the foamed explosives as described in Addendum 1 to Appendix A of Subcontract 144.

As a result of experience obtained on this program however the following foam property limitations apparently exist with present techniques and materials:

1. Foam densities of .08 gm/cc (5 lbs/ft^3) or less can be obtained; however, these foams generally have a cell size larger than 1 mm. A density of less than .08gm/cc cannot be obtained with filler loadings greater than about 35%. Densities of less than .16 gm/cc (10 lbs/ft^3) cannot be obtained with filler loadings greater than 65%.

2. A density variation of less than 5% is attainable, but greater uniformity appears to be very difficult.

3. Energy of over 1 Kcal/gm can be achieved with present nitro-polymer systems.

4. Drop sensitivity can be made lower than that for [illegible] [illegible] [illegible]

2. Nitropolyurethane foam samples will be produced with physical properties to be determined by mutual agreement between University of California and Aerojet.

Since all possible physical properties which may be obtained are not known, and inasmuch as the requirements depend on results of hydrodynamic tests performed on foam samples, it is difficult to specify the most desirable foam properties at this time.

The remaining effort on the foam phase of the program will be directed generally toward attainment of higher energy, higher impact sensitivity and lower density foams. Foam samples with optimum properties will be supplied to University of California. It is recommended, however, that the specific properties remain flexible since the requirements may change.

Funding

The balance of funds available on the present contract appear at this time to be adequate to:

1. Evaluate EL 506-L1 explosive strands as outlined above.

2. Prepare several foam samples with maximum explosive loading level and minimum density possible.

The foregoing effort, will however, require that the contract be extended 45 days (July 22, 1960) to conduct technical research as outlined herein with an additional 60 days (Sept. 22, 1960) for the final report.

The following table reflects how funds have been used so far on the program and essentially how the balance of funds will be budgeted.

	Alloted Funds	Expended as of 5/13/60	Balance Remaining	Proposed Budget
CHL DIV (Phase I-Trains)	$35,612	$19,921	$15,691	$ 2,[illegible]
CHL DIV (Phase II-Foams)	21,962	15,715	6,247	19,938
GSD DIV (Phase III-Testing)	31,464	23,037	8,427	8,427
	$89,038	$58,673	$30,365	$30,365

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Your expeditious approval of this proposal will be greatly appreciated. If, however, you require additional information please do not hesitate to contact the undersigned.

AEROJET-GENERAL CORPORATION

E. F. Morris
Contract Coordinator

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