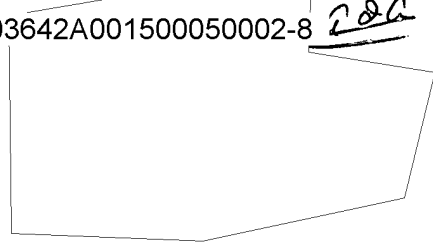


200

CONFIDENTIAL



ILLEGIB

**PROGRESS REPORT**  
**FOR**  
**JUNE 1958**  
**ON THE**  
**REDESIGN OF THE P I CASE**  
**RD 45, TASK ORDER I**

28 July 1958

DOC 6	REV DATE	15/6/80	BY	37169
GRIG COMP	56	OPI	56	TYPE 30
GRIG CLASS	m	PAGES	25	REV CLASS C
JUST	22	NEXT REV	2010	AUTH: MR TC-3

CONFIDENTIAL

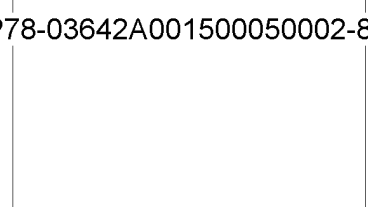
During the early part of the month, a visit was made to the plastic molder who had previously received our prototype. The new case was discussed in some detail and it was shown that, except for a few minor design changes, the case could be manufactured as submitted. A tentative assembly drawing of the new case was received from the molder at the end of the month. It is not proposed to do any further work on this program as the scope of work has been completed and the funds are almost expired. A final report covering the work performed will be submitted next month.

FINANCIAL STATEMENT

Total Amount of Contract	\$ 13,670.00
Expenditures for June 1958	108.45
Total Expenditures to 30 June 1958	13,374.60
Balance of Contract	295.40

Expiration Date: 8 July 1958

*Rec'd 7/16/58*



*file: Incendiary,  
Aircraft Fire,  
started*

**PROGRESS REPORT  
FOR  
MAY 1958  
ON THE  
REDESIGN OF THE PI CASE  
RD 45, TASK ORDER I**

**25 June 1958**

The initial prototype of the new PI Case which had been shipped to the Project Officer the previous month was tentatively approved and at his request, a further prototype, which had been fitted with the necessary clips, was sent to the plastic molders in New England for their evaluation. It is proposed to visit this firm early next month for their opinions with regard to a small pilot production order on this item.

**FINANCIAL STATEMENT**

Total Amount of Contract	\$ 13,670.00
Expenditures for May 1958	86.71
Total Expenditures to 31 May 1958	13,266.15
Balance of Contract	403.85

Expiration Date: 8 July 1958

*Done*  
*7/16/58*

got ~~IT~~  
1 copy to WBE  
A-T ADD  
file: Incendiary  
Attachable Fire  
Starter

**PROGRESS REPORT**  
**FOR**  
**APRIL 1958**  
**ON**  
**REDESIGN OF PI CASE**  
**RD 45, TASK ORDER I**

**20 MAY 1958**

An initial prototype of the new PI case, with a smooth base and the double firing system recessed on the upper face, was delivered during the month. This unit, however, was not fitted with all the necessary clips and a second more complete prototype is expected to be ready by the beginning of next month.

FINANCIAL STATEMENT:

Total Amount of Contract	\$ 13,670.00
Expenditures for April 1958	269.07
Total Expenditures to 30 April 1958	13,179.44
Balance of Contract	490.56

Expiration Date: 8 July 1958

9K  
H. B. Q. 2C  
file: INC.  
Attachable Fire  
starter

Reid 5/1/58

PROGRESS REPORT  
FOR  
MARCH 1958  
ON  
REDESIGN OF PI CASE  
RD 45, TASK ORDER I

21 April 1958

Work on this program was temporarily shelved during the month. It is expected that a prototype with a smooth base and the double firing system mounted on the upper face will be ready towards the middle of next month.

FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for March 1958	----
Total Expenditures to 31 March 1958	12,910.37
Balance of Contract	759.63

Expiration Date: 6 April 1958  
(Applied for extension to 6 July 1958)



*Rec'd  
4/17 to WDC*

*9K*

*1 copy file: Znc.*

*Peak  
Attachable fire starter*

**PROGRESS REPORT  
FOR  
FEBRUARY 1958  
ON  
REDESIGN OF PI CASE  
RD 45, TASK ORDER I**

**1 April 1958**

Two prototypes of the redesigned case were submitted during the month for approval. It was noted, however, by the project officer that there was one failing in the new design which had been overlooked, namely, that the case could no longer be set down flat on either side. It was, therefore, the recommendation by the project officer that we try and prepare one prototype of a case having all the necessary depressions for the pencils and fire starters on one side and the reverse side being left smooth. As this decision was made toward the end of the month, there was only a slight expenditure on the contract.

#### FUTURE WORK

A prototype will be submitted containing the firing devices located on one side of the PI case and the reverse side being left smooth in order that the case can be left in close contact with any substrata upon which it is placed.

#### FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for February 1958	\$ 200.36
Total Expenditures to 28 February 1958	\$12,910.37
Balance of Contract	\$ 759.63

Expiration Date: 6 April 1958 *WKS*

*file : Incendiary,  
Attachable Fire Starter*

25X1

**PROGRESS REPORT  
FOR  
JANUARY 1958  
REDESIGN OF THE PI CASE**

**RD-45, TASK ORDER I**

**25 February 1958**

A sufficiently large number of redesigned nitrocellulose PI cases were molded and fitted with incendiary units to establish the compatibility of the design with the attached mechanisms. However, a surveillance study indicated that the plastic clip holding the pencil to the case softened after several hours at a temperature of 165°F, thereby permitting the pencil to be dislodged from the case by mechanical shock. Rather than substitute spring metal or metal-filled plastic materials for the nitrocellulose clips, it was suggested by the Project Officer that a molded nitrocellulose strap be cemented across the cavity holding the fire-starter. This strap, in conjunction with the existing clip holding the incendiary unit, would hold the fire-starter firmly in the cavity even if the pencil were hanging free of the PI case. Several cases, equipped with this modification, will be submitted for final approval.

A comparative investigation of methods for filling the PI cases with M1 napalm was initiated. Direct mixing of the hydrocarbon and thickener inside the case resulted in an improperly dispersed gel, despite the fact that the recommended procedure and elapsed time of mixing was followed. The use of transparent cases for this operation gave visual evidence of stratification in the mixture, showing agglomerates of dry napalm suspended in gelled thickener. Internal mixing of the thickener without agitation developed a gelled barrier separating raw hydrocarbon and dry napalm. These phenomena were exhibited in gels of 7%, 8% and 9% M1 napalm in Stoddard solvent.

An alternate procedure for loading the cases by pressure injection of the gelled napalm through a capillary tube inserted to the deepest portion of the case was found to be a superior technique. In this process, the gel was forced into the lowest recess of the case until the material extruded from the vent space between the outer wall of the capillary tube and the opening in the top of the case. This accomplished the absence of air bubbles from the case, while withdrawal of the capillary tube left a void approximating the required 5% outage. Since the napalm had been well mixed and gelled before injection, no evidence of stratification was apparent.

The injection technique was found to be mechanically limited to the use of gels having a concentration of 8% napalm or less. A volume of 180 cubic centimeters of 8% napalm in a redesigned PI case was found to have a nominal burning time of eleven minutes. This may be compared to a burning time of nearly 15 minutes for 165 cc. of 8.7% napalm contained in the present PI case. However, it is believed that the napalm used in the injection studies may have been altered by long-term storage; repetition is in process with comparatively "fresh" napalm.

#### FUTURE WORK

Studies of injection loading of the PI cases will be repeated in order to substantiate recommendations pertinent to napalm concentrations and burning time.

FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for January 1958	\$ 3,228.38
Total Expenditures to 31 January 1958	\$12,710.01
Balance of Contract	\$ 959.99

Expiration Date: 6 April 1958

1 copy to  
wife.  
JA HB.

file: Incendary,  
Attachable fire started

PROGRESS REPORT  
FOR  
DECEMBER 1957  
ON  
REDESIGN OF THE PI CASE  
RD-45, TASK ORDER I

8 JANUARY 1958

25X1

A laboratory process for swaging nitrocellulose sheet was developed which produced plastic moldings of the desired shape with depression for accommodation of the firing mechanism. Pressure molding was performed under the surface of a water-glycerine mixture at 102°C with the use of a hand-operated, screw-driven press. The male-female molds were planed to tolerances which precluded stretching or folding in the cast sheet. In addition, the head on the perimeter of the casting was automatically flattened to improve the surface for bonding. A jig was constructed to hold the bonding surfaces of the two case halves under pressure, while they were in process of being cemented with a slow-setting nitrocellulose cement.

A molded nitrocellulose clip was designed which would firmly hold a fire-starter in the PI case surface cavity, permitting ignition of the incendiary unit either by fuze or attached pencil. At present, a second clip is being designed to effectively attach the pencil to the case.

#### FUTURE WORK

On completion of the assembly of the prototype units, a study will be made to determine the most efficient method of filling the case with napalm.

#### FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for December 1957	\$ 3,096.96
Total Expenditures to 31 December 1957	\$ 9,493.76
Balance of Contract	\$ 4,176.24

Expiration Date: 6 April 1958

*Rec'd  
ED  
2/7/58  
1600*



#28

file: 182F

PROGRESS REPORT  
FOR  
NOVEMBER 1957  
ON  
REDESIGN OF THE PI CASE  
RD-45, TASK ORDER I

13 DECEMBER 1957

The techniques described in earlier progress reports for molding nitrocellulose sheet by solvent vapor softening and thermal extrusion were abandoned as unsatisfactory. A more efficient method was developed in which the molding process was performed under a water-glycerin solution maintained at a temperature of 100-102° C. This process yielded castings which did not display clouding, crazing or stretching in clear nitrocellulose.

Tentative approval of the basic design was given by the Project Officer on the basis of his inspection of a replica casting of the case.

#### FUTURE WORK

Several PI cases will be made from the black nitrocellulose sheet, fitted with nitrocellulose clips for attaching the pencils and fire-starters and will be submitted for final approval of the design.

#### FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for November 1957	\$ 1,864.15
Total Expenditures to 30 November 1957	\$ 6,396.80
Balance of Contract	\$ 7,273.20

Expiration Date: 6 April 1958

*file: ED 182F*  
*Invent Attach FS.*

**PROGRESS REPORT**  
**for**  
**OCTOBER 1957**  
**on**  
**REDESIGN OF THE PI CASE**  
**RD-88, TASK ORDER I**

21 November 1957

A plaster model of the redesigned incendiary unit, as illustrated in the Progress Report of September, 1957, was constructed according to the finalized dimensions. A male Kirksite mold was cast from this model, which in turn was used in casting a female mold of aluminum filled Epoxy resin. In the casting operation, an inert, removable coating was spread on the surface of the male mold to a depth of 0.035" before the resin-metal mixture was poured into the mold. This operation produced final molds which, when nested, displayed similar contours differing by 0.035", i.e., the thickness of the final nitrocellulose molded item.

Initial attempts to form nitrocellulose castings for the incendiary case were made by pressing sheets of 0.030" thick nitrocellulose in the molds at a temperature of 100-110°C. The molds were held between the electrically heated platens of a hydraulic press. Pressure was continuously applied throughout the operation; that is, as the softened nitrocellulose was extruded into the mold cavity, gauge pressure was held constant by maintaining continuous motion of the ram.

Castings produced by this technique were found to be thin at the shoulders and at the deepest portion of recessed curved surfaces. This apparent stretching of the nitrocellulose indicated insufficient softening of the plastic, but further increase in the molding temperature was unwarranted in view of the proximity of the ignition temperature.

As an alternate approach to the molding of nitrocellulose, the sheet was softened in acetone vapor before the extrusion process was attempted. This technique eliminated the hazards encountered in thermal molding, but introduced the necessity of carefully controlling the time interval of vapor phase treatment to prevent crazing or clouding of the plastic. In addition, it may be found necessary to "water dry" the molded cases made according to this method in order to remove entrained solvent. A study of this procedure is currently in process.

#### FUTURE WORK

It is planned that several prototype cases will be prepared, using the black nitrocellulose recently obtained from the manufacturer of the old PI case. These engineering prototypes will be assembled for the purpose of determining the changes in geometry, if any, which may be necessary before submitting a final design.

#### FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for October 1957	2,418.91
Total Expenditures to 31 October 1957	4,532.65
Balance of Contract	9,137.35

Expiration Date: 6 April 1958

*F. B. I. ED-1827*

**PROGRESS REPORT  
FOR  
SEPTEMBER 1957  
ON  
REDESIGN OF THE PI CASE**

**RD 45 - Task Order I**

**8 October 1957**

An initial attempt to modify the PI case for use with an M-1 pencil, fitted with a coupling base, was made by locating the assembled unit (pencil, coupling base and fire-starter) recessed diagonally in the faces of a plaster mock up case. This method required a considerable increase in the length of the unit in addition to introducing undesirable projections on the major surfaces.

In order to overcome the excessive length of the complete firing mechanism, the use of a flexible connection between the coupling base and the fire-starter was investigated. A study was first performed on this type of system, in which the coupling bases were connected to the fire-starters with different lengths of 1/8" ID Tygon tubing. Ignition was accomplished both when the coupling base and the fire-starter were in a straight line and also when the tube was bent through a radius of 1/2". Angular displacement of the fire-starter and coupling base was then increased to 360° without failure in ignition. In a single experiment, successful ignition resulted by transfer through a Tygon helix of 1" diameter and 2 1/2 revolutions. A total of eleven remote ignition transfers, without failure, have been made at ambient temperature.

These encouraging results led to a design as shown in Figure 1 using the dimensions of the old case. For the purpose of enhancing reliability of ignition of the nitrocellulose case, it was believed that embedding the fire-starter on the face might be desirable. The pencil and fire starter are then parallel to each other, connected by a semi-circular section of Tygon tubing (see Figure 2). Since the fire-starter was seated in the depression on the surface of

the case, it was necessary to locate these units on opposite faces, and opposite ends of the nitrocellulose case, in order to present the maximum surface for ignition. This location permits the manufacture of identical halves of the case from one mold.

The projecting flange on the coupling base creates a design problem. This could be overcome by removing the threaded flange on the coupling base, cutting it down to the diameter of the pencil. It would avoid providing two cavities in the case and would permit simpler molding and better sealing of the two halves of the case.

*this is out*

FUTURE WORK

Initial thermoplastic prototypes will be hand-made to further study the design and molding problems. Present arrangements will be submitted to the project officer for evaluation.

FINANCIAL STATEMENT

Total Amount of Contract	\$13,670.00
Expenditures for September, 1957	1,862.20
Total Expenditures to 30 September 1957	2,113.74
Balance of Contract	11,556.26

Expiration Date - 6 April 1958

CONFIDENTIAL



**Page Denied**