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EB-1880

[redacted]

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FINAL REPORT

Contract RD-77, Task Order "K" / AIRCRAFT IDENT MARKINGS

Prepared for:

[redacted]

50X1

Report No. 548

12 January 1961

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FINAL REPORT

Contract RD-77, Task Order "K"

Prepared for:

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Report No. 548

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I INTRODUCTION

This report describes the work performed by [redacted] 50X1
[redacted] during the course of Task Order K from 25 June 1959 to 10 January 1961. 50X1
The objective of Task Order K was the development of devices which would permit the changing of aircraft identification markings during flight.

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II PROJECT HISTORY

A. General

The Scope of Work of Task Order K covered the development and fabrication of a "device for obscuring, removing, and/or replacing aircraft markings and insignia during flight". This development was conducted in two phases. Phase I was an initial investigation to determine the most feasible concepts, and Phase II was to be the preparation of a demonstration mock-up according to the concept evolving from Phase I. The direction of effort during Phase I was pointed out in [redacted] Proposal Report No. 463, which suggested several concepts which included mechanical devices and conbustible concepts. 50X1

B. General Requirements

The purpose of the equipment under consideration was to make it possible to (1) erase or obliterate specific external insignia and markings while in flight so that no identifying markings or insignia were visible, (2) reestablish the external insignia and markings so that identification was as before the action of (1) above, and (3) jettison the entire installation(s) to leave minimum evidence of the installation. In fulfilling these functional requirements, it was desired that no fragmentation exist that would serve as evidence of the action that was taking place. Furthermore, reliability was of extreme importance. As in the case of all equipment that must be subjected to the elements, it was necessary that the device function properly at temperature extremes, be

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insensitive to discharges of static electricity, be resistant to sand and rain erosion, and remain operative when subjected to freezing rain.

Initially, the aircraft upon which the device was to be mounted was defined as typical of the C-54 aircraft. This information indicated a maximum operating speed of 200 knots. Because of the possibility of eliminating all fragments with a combustible process, this technique was initially preferred by the customer over mechanical concepts. It was estimated that the construction and materials that would be required in a combustible concept could barely withstand the 200 knot maximum speed; however, the device would require a relatively short life.

C. Initial Approach

The contractor proceeded to investigate materials, equipment, and designs that would be compatible with the combustible concept. In this effort, the contractor attempted to establish means of constructing and actuating a laminated assembly of combustible layers. The theory of operation would require that the outer layer bearing the desired markings would be initiated and burned off, leaving the second, unmarked, layer exposed and relatively free of ash or smudge. Initiation and burning of the second layer would reveal the third layer, which would bear markings similar to those of the first layer. The study of this concept included, (1) a search for materials which could be produced in sheet or which could be applied to a sheet which would sustain combustion in a 200 knot wind when subjected to rainfall, and which could be ignited electrically; (2) a search for electric initiators which could be applied to a sheet form; and (3) a study of construction techniques which would provide sufficient mechanical strength and which would permit the successive layers to be isolated from preceding layers to prevent uncontrolled ignition of the lower layers. In this effort, the contractor tested sheet explosives by Dupont, cellulose nitrate sheets from the Nixon Nitration Works, Chlorate mixtures, and films of double base propellants. None of these materials were satisfactory either because their reaction was too violent, because they failed to continue burning in a wind stream, or their residue was too heavy. The most promising layering technique consisted of applying a heavy coat (.016, approximately) of a potassium chlorate mixture to a fine cotton cloth, bonding this coated cloth to the base surface with a stripable adhesive, and initiating separation of the cloth at the leading edge with a flattened vinyl tube that was expanded by a black powder fuze cord. After separation of the coated cloth, the chlorate mixture was to be ignited by a delay action mechanical match. This technique eliminated the necessity of isolating the individual layers since ignition occurred only after the sheet was separated from the aircraft. Because of more feasible developments, this technique was not developed fully. 50X1

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During the contractor's search for materials, a classified combustible process which had been developed by [redacted] came to the contractor's attention and clearance was requested so that [redacted] representatives could investigate further the potentials of this process. 50X1 The [redacted] process consisted of an electrically conductive pyrotechnic material which could be applied as a matrix network in liquid form. 50X1 This matrix network when cured would ignite and burn when an electric charge

 [redacted]

of sufficient power was passed through it. The original intent of this material was for application as a surface igniter for various solid propellants. It was hoped, however, in our study that some unique characteristic would exist that would make it possible to apply this material to the combustible laminate. Actually, this igniter material alone was not suitable for the application desired. However, in working with personnel of [redacted] a technique was 50X1 evolved which indicated that a satisfactory combustible laminate could be devised. This technique consisted first of an isolating layer of inert chaff, a network of the surface igniter, a continuous layer of a highly nitrated fibrous material, 50X1 and a thin plastic film bearing insignia markings. This was essentially the construction of one layer of the laminate. [redacted] contracted with [redacted] 50X1 [redacted] for the fabrication of three test samples of three-layer laminates, 50X1 eight inches square, which were constructed in this manner. Edges of the individual layers were staggered to avoid uncontrolled ignition from one layer to the next and the edges were sealed with a ribbon of epoxy resin. These samples were tested in an air blast which was obtained by dumping air from a storage tank through a spreading nozzle. These samples indicated (1) a tendency for ignition of the underlying layers to occur at the edges, and (2) inadequate strength of the outer plastic cover sheet. Air velocities as high as 240 knots were obtained and on occasion the plastic cover sheet would be ruptured at this velocity.

Upon evaluating these tests, it was concluded that (1) better isolation of the individual layers at the edges was required, (2) a stronger outer cover was required, and (3) means of securing the laminate at points inside the edge boundary were required. Additional test samples were fabricated incorporating [redacted] 50X1

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changes which would improve performance. These later test samples were six inches square. Burning characteristics were greatly improved and burning across the layers at the edges was eliminated. However, on those samples which incorporated mechanical fasteners to bind the laminate together, flame would propogate to successive layers passed the fasteners and the entire laminate would be destroyed. These tests showed that a severe problem existed in determining a suitable means of securing the laminate to the surface of the aircraft and in holding the individual layers to successive layers. In an effort to achieve this end, a search was initiated for a combustible adhesive which could be used to bond the various insignia layers together and which could be activated with the [redacted] surface initiator. We received some indication through various contacts that such a material had been developed under a classified contract for the [redacted] Before this material could be investigated further, the contractor was advised that a change in specification was forthcoming that would render the combustible concept unfeasible. During May of 1960, a change in aircraft to which the device was to be applied necessitated increasing the operating speed from 200 knots to 300 knots. Due to the limitations in the mechanical strength of materials involved in the combustible design and the unsolved retention problems, it was mutually agreed that the combustible concept should be abandoned and efforts made to conceive a mechanical design which would in essence serve the same purpose.

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D. Preliminary Work on Mechanical Concept

Upon changing to a mechanical design, it was necessary to alter that portion of the requirements which restricted the size of fragments that would exist when the device was actuated. From a practical standpoint, it would

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have been impossible to operate such a device without creating some fragments if the device were to be of a simple nature and one which would not require extensive modification of the aircraft. Thus, the requirements were changed to allow fragments not to exceed 144 square inches in area.

In attempting to arrive at a suitable mechanical concept, the contractor studied every device known to him which involved quick-release mechanisms, break-away fasteners, and other separable joints. Eventually, two schemes were conceived and preliminary designs were prepared for evaluation by the project engineer. These initial designs are illustrated by Drawing Nos: 101333 and 101334. In each of these concepts, a three-layer insignia panel was made up of several sheet metal elements which were locked together and to successive layers by mechanical fasteners which could be released at will. Each element of each insignia layer was to be of a size and proportions which were compatible with the size of the insignia, but the area of each element would not exceed 144 square inches. It was estimated that the maximum size of these elements would be approximately 8" x 10". In each design, the three-layer insignia panel was mounted to a base sheet assembly which in turn was fastened to the outside of the aircraft with releasable fasteners. The entire assembly could be jettisoned either by releasing the three panels in sequence and then releasing the base sheet assembly, or by releasing only the base sheet assembly. In this latter case, the entire insignia panel assembly would have been jettisoned as one unit.

After reviewing these designs, the Project Engineer authorized the contractor to proceed with the detail design and fabrication of demonstration units based upon the design of Drawing No. 101334.

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E. Concluding Activities

Due to circumstances beyond his control, the contractor has been unable to accomplish all of the objectives of the Task Order. In May of 1960 a specification change necessitated embarking upon a new approach after approximately 50% of the available funds had been spent in pursuing the combustible concept. Thus, funds were extremely limited for conducting a new concept study, preparing designs and fabricating demonstration units. However, in a period of less than three months, the contractor arrived at a concept which appeared feasible and was able to complete Phase I under the new requirements. Coupled with the adverse technical situation as brought about by the new requirements, corporate interests to which [redacted] 50X1 is responsible made a decision to discontinue this division on approximately 1 January 1961. Thus, with limited remaining funds and restrictions on [redacted] activities through a loss of engineering and shop personnel, the contractor 50X1 was advised by the Project Engineer to utilize the remaining funds for the preparation of detail designs of the approved concept. This has been accomplished and it is hoped that sufficient data has been generated to permit other activities to continue this development if the requirement maintains.

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III DESCRIPTION OF COMBUSTIBLE DEVICE

A preliminary investigation of combustible materials was made to determine which items had the requisite flame strength and inherent safety necessary to the application. Representative samples of the most promising items were tested to establish combustion rate, wind resistance, and the masking effect of combustion products. Cellulose nitrate compounds, black powder and starch-chlorate mixtures were selected as the most promising of the initial combustibles reviewed.

Deposits of combustion products, except in the case of cellulosics, were objectionable. Any of the burning compounds having non-gaseous end products could be expected to mask the underlying layers. These non-gaseous products had sufficient adherence to resist removal attempts using compressed air shop blow guns. In the case of cellulose nitrate sheets, an oily deposit was left after burning which was attributed to the plasticizers used in the manufacture of these commercial sheets. Intumescent (foaming) paints failed to halt heat destruction of adjacent layers. Further, the residue of these paints was a hard cake, not easily removed even by scraping.

Subsequent investigation followed two paths:

1. Use of massive amounts of combustibles in a manner in which adjacent layers were not affected.

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2. Use of finely divided or highly porous combustibles to provide complete burning without sufficient heat transfer through non-ignitable layers to affect adjacent areas.

To enable the use of the first approach, means of separating the burning layer and subsequently igniting it in a remote area were investigated. It was demonstrated that a collapsed, sealed, plastic tube containing several strands of quarry cord fuse was an effective separating device. On ignition of the fuse, expansion of the tube by the evolution of gaseous combustion products was employed to break a bonded sheet or to remove a metal retaining edge strip. The ambient slip stream could then remove the balance of the sheet. In doing so, a pull fuse igniter would be actuated to initiate combustion in the main sheet at a place sufficiently remote from the adjacent layers.

The combination of materials deemed satisfactory for initial use in experiments were cloth treated with an oxidizer (either silk or cotton) and a suspension of starch-chlorate compound mixed with an equal weight of bulk smokeless powder. The chemicals were suspended in an acetone carrier and brush applied to the cloth. Remedial defects were experienced in the separating test, but the combustion and insignia destruction were effective and complete. The complexity of this approach warranted further research into the use of finely divided or spongy combustion materials that could be burned in situ.

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A further problem in the use of separating layers was the slip stream forces to be expected. If flutter were to be encountered in a large installation, the use of a strippable adhesive to tack the layers to each other would be mandatory. Initial analysis revealed the slip stream force. Full scale tests would have been necessary to satisfactorily establish this point.

A fibrous cullulose nitrate based combustible, known as flash paper, was tested by burning between glass plates. This commercial product showed great promise in that combustion was near complete with hardly any residue left on the glass. Search for materials revealed that [redacted] had developed proprietary propellants which they felt could be adapted to the following requirements: 50X1

1. Electrical ignition.
2. Gaseous end products.
3. No residue sufficient to degrade patterns of underlying areas.
4. Insufficient heat transfer to ignite adjacent layers.

Accordingly, a sub-contract was let to [redacted] for the development of a three-layer, 8-inch by 8-inch prototype to meet these requirements. Small initial samples, using electrical ignition and a spongy cellulose nitrate based propellant main sheet material, were demonstrated and the results were most encouraging. 50X1 [redacted] 50X1

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During the week of 11 April 1960, three of the sample 8" x 8" laminates fabricated by [redacted] were tested. These were essentially the same as smaller samples previously successfully demonstrated by [redacted] without the use of any strong wind. In this case, a compressor tank was bled down through a funnel, creating maximum stream velocities in the 200 knot range. 50X1 50X1

All samples were successfully ignited by an electrical pulse generator developed by [redacted] In the first test, the wind created by the blowdown apparatus snuffed out the flame after partial burning of the first layer. Upon reignition by a hand held match, the first layer destruction was completed, but, in the process, also ignited and destroyed the other layers. 50X1

The second sample was tested. The first layer burned successfully but left large pieces of the inert covering layer intact. These were cut away and the second layer was ignited and burned; but it too ignited the remaining layer to destroy the sample. Films taken of this sequence indicate that the ignition of subsequent layers very likely occurred at the edges of the samples where edge binding of the combustible layers could create a heat trap for the chaff and burning material.

The final sample contained rivets to help ascertain the effect of fasteners on the laminate. After ignition of the first layer, the flame ignited the subsequent layer at one of the rivet points. Flame flash-through in confined areas is therefore very apt to destroy subsequent layers in the current scheme.

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On 11 May 1960, three two-layer samples were subjected to a 200 knot wind test to ascertain the possibility of eliminating some of the difficulties encountered in the previous run. In each sample, more liberal use was made of the electrical igniter strip, fireproofed chaff was used, and an overhanging layup technique was used to separate the edges from each other. One of the samples employed a hotter burning material than used previously.

The only difficulty experienced in the first sample was wind lifting of the leading edge of the second layer. The first layer burned clean, but its removal exposed the leading edge of the second layer. The second layer was blown off the mount intact, without igniting. The markings were not destroyed or affected on the second layer.

The second sample was clamped over the top burning layer to protect the edge of the bottom sheet from the wind. Sheet one was ignited, burned clean, and did not affect sheet two. This second sheet was preserved as a sample and was forwarded to the Project Engineer for examination.

Test sample three was also clamped over the edge of the top layer to prevent the wind from lifting the bottom layer. It burned hotter and clean, but the entrapped combustible ignited the second layer to destroy the sample. It is felt that had the edge bond been strong enough to resist the wind effects, full use of the overlapping bonding technique would have prevented this sample's destruction from entrapped combustibles.

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After completing the foregoing experimental work, the remaining major problems appeared to be:

1. Bonding of the edge, to resist wind removal, in such a manner that the edge would burn clean or was not noticeable after the layer is ignited.

2. Bonding of the layers to each other and the mounting panel to prevent the effects of flutter.

3. Jettisoning arrangements for the entire installation.

4. The effects of environment, wind, rain, and erosion.

The actual burning of the samples functioned reasonably well if enough igniter material was used. The burning of the latter samples was clean and complete. Hotter materials were available but it was felt that their use was not justified. The more liberal use of igniter material was felt to be adequate.

The technique of avoiding edge ignition of subsequent layers by use of overlapping layers appeared satisfactory. If the bound edges were adequately separated from the adjacent layers, the entrapment of combustibles in the bonding area did not jump the safety border margin to ignite the other layers.

Several bonding agents are on hand for future work. It was considered to attempt the development of a strong, clean burning bonding agent to eliminate all traces of the installation after its ignition. The various materials that would have been tested were to be subjected to wind tests to ascertain both their holding ability and their burning characteristics. An alternative would have been the use of clear bonding agents which would not burn, but which would not have been detectable at reasonable distances.

Several approaches were available to overcome the bonding problem, among them the use of strippable adhesives, riveting, sewing, and stapling. The combination of a non-combustible thread used to quilt the layers together in conjunction with a bonding method to attach the assembly to the aircraft hull was considered as the initial development. Several approaches were to have been tested for both wind strength and ignition effects to establish an adequate means of layer bonding.

The anticipated problems were that the use of bonding agents may have inhibited the dispersion of combustion products and resulted in some loss of clarity. Physical attachment, on the other hand, had attendant dangers of greater heat transfer or possible arcing over of flames along the walls of threads or rivets. Figure 1 shows the initial approach considered.

The jettisoning arrangement that was being considered was the simultaneous ignition of all layers. The electrical pulse generator developed for use in the preliminary tests worked well. Expectations were that the same approach with larger capacity would do equally well in full scale tests. The unit would be sized to meet the peak load necessary to destroy the entire laminate. No serious problems were anticipated in this portion of the work.

The environmental effects could have been most effectively determined in the field. While water and erosion conditions can be simulated in the laboratory, full scale wind testing would have been prohibitive in cost for winds in excess of 90 miles per hour. Further investigation of means of satisfactorily determining wind effects were considered. The two methods were flight testing of samples versus a small wind tunnel.

Further efforts were to be concentrated on the edge and layer bonding problems. When these problems were eliminated, the full scale and environment tests were to be considered.

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IV DESCRIPTION OF MECHANICAL CONCEPT

A. General

The detail design as described in this section has been prepared for a unit which will be installed on the Helio Model H-395 aircraft. Overall dimensions of the unit are approximately 22-5/8" x 39" x 1[illegible]. Installation is to be made on the fuselage at approximately one-half the distance from the wing trailing edge to the leading edge of the horizontal stabilizer. The center of the insignia is to be clocated vertically at the axis of symmetry of the fuselage formers. Horizontally the center of the insignia will be located at the fuselage former P/N 391-031-205.

The panel assembly consists of three base panel assemblies (Drawing No. 364-300, 364-300-1, 364-300-2, and 364-300-3) which are spaced away from the fuselage 5/8" by four channel members. Ballistic actuators, actuating cables, cable guides, and electric cabling are located in this space between the base panels and the fuselage skin and are mounted on the base panels. Attached to the outer surface of the base panel assemblies are two layers of sheet metal elements which can be shed at will to change the identification markings. The outer layer will bear the desired insignia, the second layer will be an unmarked aluminum surface and the outer surface of the base panels will bear the same insignia as the outer layer.

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B. Detail Description

1. Base Panel Assemblies (Refer to Drawing No. 364-300). The base of the insignia panel consists of three panel assemblies which consist of sheets of .081 aluminum alloy to which are spot-welded sheet metal channel sections to space the base panels away from the surface of the aircraft. These base panels are keyed together and attached to the side of the aircraft by ten hold-down and anchor assemblies (Drawing No. 364-406). When thus assembled, the base panels form a continuous surface to which the outer separable layers are attached. The hold-down and anchor are held into an assembly by 1/8 inch diameter cotter pins. These pins pass through the tongue and groove joint of the hold-down and anchor. This joint is oriented parallel to the direction of flight. To jettison the panel assembly, the jettison ballistic actuators are energized to pull the cotter pins by the cable assemblies (Drawing No. 364-302). As the pins are pulled, the tongue and groove joint will be released and air drag against the panel will cause the hold-downs to slip aft from the anchors and separate from the aircraft. In order to secure the panel assembly as an integral unit before installation on the aircraft four AN3-5 bolts attach the two end panels (-1 and -3) to the center panel (-2). After the assembly has been installed on the aircraft, it is necessary to remove these four bolts before take-off. Otherwise, the assembly will be jettisoned as a complete panel 22" x 39" instead of three smaller panel sections.

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2. Panel Elements (Refer to Drawing Nos. 364-400 through 364-405).

The two separable insignia layers are made up of small sheet aluminum sections .031 thick x 4" x 5" which are keyed to each other and the underlying layers by interlocking tabs. The geometry and operation of these tabs are illustrated on Drawing No. 101334, sheet 1. When the assembled elements are held in the farthest most forward position by the cotter pins and angles of Drawing Nos. 364-300: -300-10, -300-11; 364-404, and 364-400, the assembly is secured. When the cotter pins are pulled by the release actuators through the pull calbes of Drawing No. 364-302, the assembly of elements will move aft under the drag of the wind stream and the locking tabs will be released from the underlying layer by the movement and forces of the spring tabs.

3. Ballistic Actuators (Refer to Drawing No. 364-301)

Power for pulling the various release cables is provided by a number of small ballistic actuators which provide a 200 lb. peak force and a stroke of one inch. Each actuator consists of a body, -1; a piston, -2; a bushing which contains the electric squib, piston seals and propellant charge. Each actuator is riveted in its respective position on the base sheets by two 3/16" diameter flush head aluminum rivets.

Two types of connectors are provided to connect the actuator piston rod to the release cables. Connector 364-301-6 connects the outer panel release cables to their respective actuators and connector 364-301-7

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connects the jettison release cables to their respective actuators. To attach the -6 actuator, the 1/4-28 nut is first removed from the connector and passed over the ball end fitting of the release cable. The cable is next passed sidewise through the slot in the side of the connector until the ball end can be slipped down into the spherical seat. The nut is then threaded onto the fitting. The connector is attached to the piston rod with a 3/32 diameter roll pin. Cables are attached to the -7 connector in a similar manner except that two flush head #6-32 screws, 5/16 inch long are threaded into the body of the connector to secure the connection.

The contractor has been unable to develop and prove the propellant charge required in the ballistic actuator. The correct propellant charge must be determined by experimentation with a properly instrumented test apparatus. This would be done by duplicating the mass of the moving components and applying a controllable non-inertia force to the piston rod and measuring the performance of an estimated approximate propellant charge. Adjustments in the propellant charge would then be made to correct the performance in the direction desired. It is estimated that the initial powder charge should be approximately 20 milligrams of DuPont 4759 SR powder.

4. Cable Guides and Fairleads

It has been necessary to mount the ballistic actuators out of the direct line of action of the cotter pins. Cable guides and fairleads have been provided to turn the release cables from the line of action of the cotter pins to the axis of the actuators. Drawing No. 364-407 illustrates the fairleads which are used to turn the element release cables. These fairleads are attached to the 364-300-1 panel assembly with four flush head 3/16 inch diameter rivets per MS20426AD6-4.

Jettison release cables are guided in the Guide Assembly, 364-300-4, which consists of two curved stainless steel tubes which are brazed to a stainless steel mounting base. The brazed assembly is in turn riveted to the base sheet with six flush head 1/8 inch diameter rivets per MS20426AD4-4.

5. Electrical Wiring

Electrical cabling between the control and power source inside the aircraft should be made up of #18 vinyl insulated stranded conductors. The conductors should be tied into a suitable cable harness and fastened to the underneath surface of the base panels. If desired break-away connectors can be provided in the conductors between the three base panel assemblies. This same type of connection can be made in the four leads which pass into the fuselage of the aircraft.

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VI APPENDIX -- DATA SHEETS

A. Velocity Data - [redacted] Samples
B. Determination of Pressure Available to Strip Combustible Layers.
C. Estimated Wind Stream Conditions.
D. Drawing No. 100900, Specification for Strippable Layer.
E. Preliminary Estimate of Blow-down Test.
F. Blow-down Set-up.
G. Requirements for Erosion Test.
H. Test Data for High Temperature Test of Combustible Coatings.
I. Summary of Activities up to 30 September 1959.

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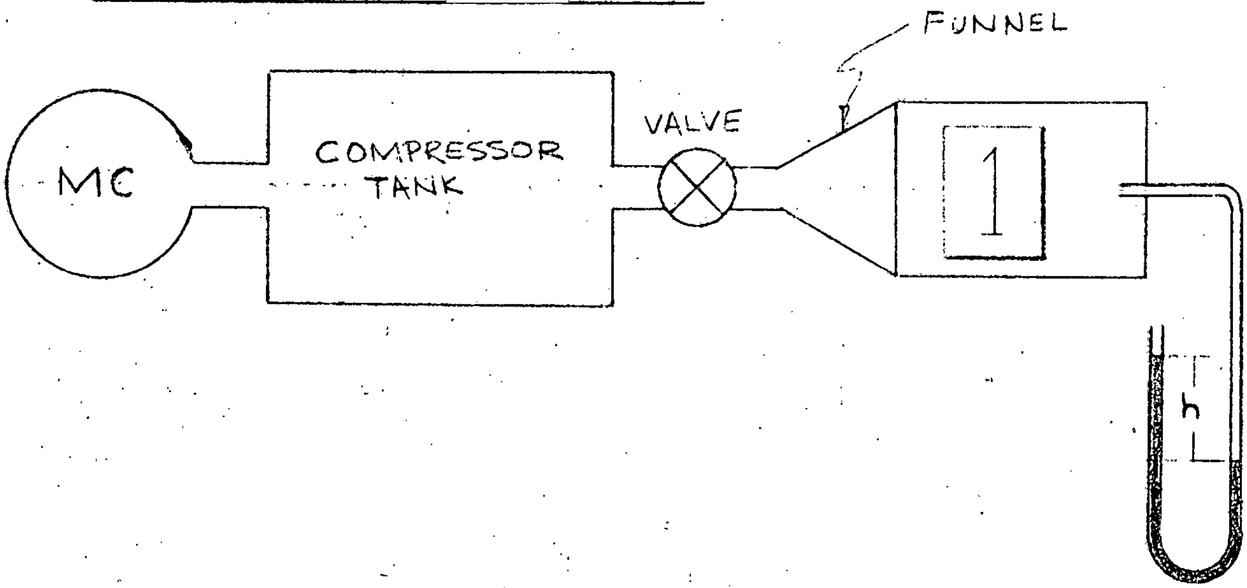
A. Velocity Data - [redacted] Samples 50X1



Blow Down Test of [redacted] Samples 50X1

Calibration at 80 psig

$$h_{hg} = 2.50 \text{ in Hg} = 2.50 \times 70.73 \text{ \#/ft.} = 177 \text{ \#/ft.}^2$$

$$\frac{177 \text{ \#/ft.}^2}{.07 \text{ \#/ft.}^3} = 2530 \text{ ft. (air)} = h$$

$$U = \sqrt{2\, g\, h_{air}} = \sqrt{64.4 \times 2530} = 4.03 \times 10^2$$

403 ft./sec. = 234 knots. max.

60 psig = 1.50 in. Hg	$\sqrt{1.50}$	$= 1.225 \sim x_1$
80 psig = 2.50 in. Hg	$\sqrt{2.50}$	$= 1.582 \sim 234$
100 psig = 6.00 in. Hg	$\sqrt{6.00}$	$= 2.450 \sim x_2$

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$$\sigma \sim \sqrt{h}$$

$$x_1 = \frac{1.225 \times 234}{1.582} = 181 \text{ knots max,}$$

$$x_2 = \frac{2.450 \times 234}{1.582} = 362 \text{ knots max.}$$

Sample No. 1 tested at 100 psi

Sheet No. 1 ignited successfully, but was extinguished in the wind when only half burned. It was reignited by a match, the flame appeared very stubborn and slow burning at the edges. The other layers were ignited, apparently at the edges, destroying the rest of the sample.

Sample No. 2 tested at 60 psi

Sheet No. 1 ignited and burned, leaving large pieces of the plastic inert covering intact. These were cut away for sheet No. 2.

Sheet No. 2 ignited and burned, but also ignited Sheet No. 3, destroying the sample.

Sample No. 3 tested at 60 psi

Sheet No. 1 (This was the riveted specimen) ignited successfully, partial destruction of inert layer, all layers ignited but extinguished by wind. Remains preserved for future discussion.

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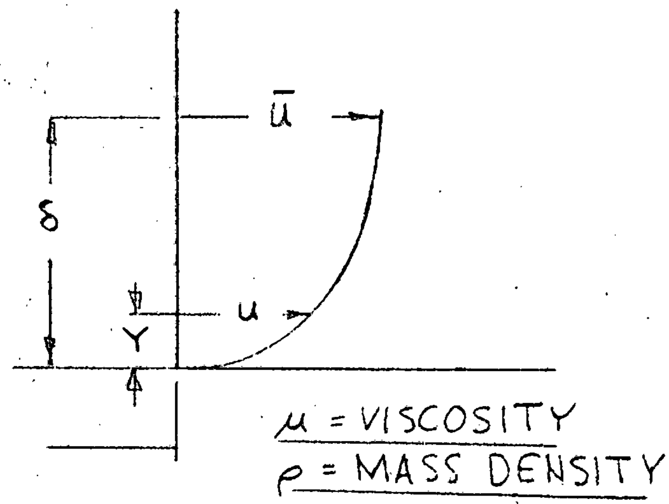
B. Determination of Pressure Available to Strip Combustible Layers.

$$\delta = .377\left(\frac{\mu}{\rho u}\right)^{.2} x^{.8}$$

$$u = \bar{u}\left(\frac{y}{\delta}\right)^{.143}$$



$$\delta = .377\left(\frac{3.5 \times 10^{-7}}{2.378 \times 10^{-3} \times 1.5 \times 10^{2}}\right)^{.2} \times 60^{.8}$$

$$= 1.58'$$

From $u = \bar{u}'\left(\frac{y}{\delta}\right)^{.143}$

$y = .5'' = .0416'$

$\delta = 1.58'$

$\bar{u} = 150$

$$u = 150\left(\frac{.0416}{1.58}\right)^{.143} = 150 \times .0264^{.143}$$

$$= 89 \text{ f.p.s}$$

$$\frac{V^2}{2g} = h_v = \frac{89^2}{64.4} = \frac{7900}{64.4} = 122.5' \text{ Air}$$

p in psf = 122.5 x .0765 = 9.38 psf

$$\text{p in psi} = \frac{9.38}{144} = .065 \text{ psi}$$

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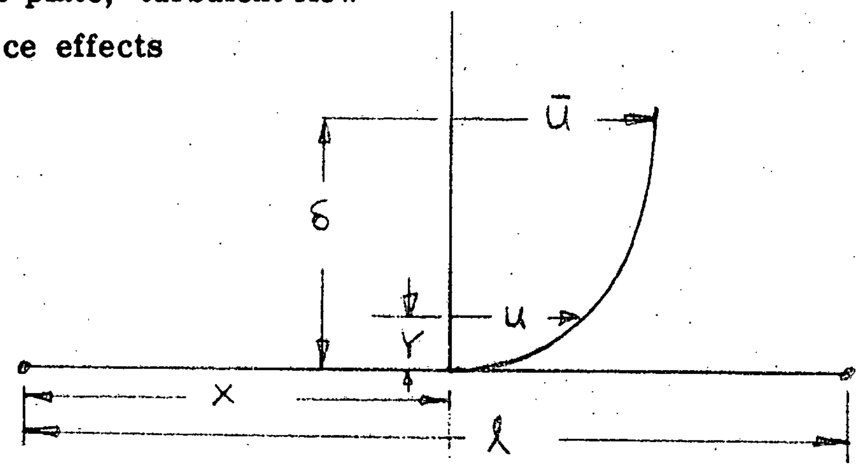
C. Estimated Wind Stream Conditions

Flat plate, turbulent flow

Force effects



$$\delta = .377\left(\frac{\mu}{\rho\bar{u}}\right)^{.2}$$

(Ref. eq. 37, p. 324, Dodge & Thompson)

μ = viscosity

= 1.808×10^{4} poises at 20° C

= 1.783×10^{4} poises at 15° C

= 3.726×10^{-7} slugs/ft.^{3}

$\frac{\mu}{\rho} = \nu$ = kinematic viscosity

= 1.567×10^{4} ft^2/sec.

re p. 169 above ref.

$\bar{u}$ = stream velocity = 160 mph $\cong$ 240 ft/sec.

x = distance along hull, = 65'

$$\delta = .377\left(\frac{1.567 \times 10^{-4}}{.240 \times 10^{3}}\right)^{.2} 65 = 23.9\left(6.53 \times 10^{-7}\right)^{.2}$$

$$= 23.9\left(.0653 \times 10^{-5}\right)^{.2} = 23.9 \quad x\left[.0653^{.2} \times 10^{-1}\right]$$

$$= 23.9\left[.58 \times 10^{-1}\right] = 1.385^{1}$$

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$$u = \bar{u}\left(\frac{y}{\delta}\right)^{1/7}$$ eg 14, p. 312 for turbulent layers.

$$u = \bar{u}\,\frac{y}{\delta}\left(2 - y/\delta\right)$$ eg 13, p. 312 for laminar layers.

$$N_R = \frac{s\,\bar{u}\,l}{\mu} = \frac{.075 \times 150 \times 65}{1.567 \times 10^{-4}} = 4.67 \times 10^6$$ ref. p. 322.

Actually, flow is transitional, refer to curves on p. 328, fig. 214, and appreciable error may exist.

use eg . 14

∴ at 1" from surface

$$u = \bar{u}\left(\frac{1}{12 \times 1.385}\right)^{.143} = 150\,\left(.0602\right)^{.143} = 150 \times .668$$

$$u = 100 \text{ ft./sec.}$$

According to the theory u is distributed parabolically. A straight line approximation in this region will give a close approach to the assumed distribution.

Stagnation Pressure

$$\frac{P_s}{P_o} = \left(1 + \frac{k-1}{z}\,\frac{V_o{}^z}{e_o{}^z}\right)^{\frac{k}{k-1}}$$ eg. 20 p. 369

V_o = 100 ft./sec.

P_o = 10 psi a = 1440 lb./ft^z

C_o = 1200 ft./sec., say

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$$Ps = 1440 \left(1 + \frac{1.4 - 1}{2} \; \frac{10^4}{1.2^2 \times 10^6}\right)^{\frac{1.4}{1.4 - 1}}$$

$$= 1440 \left(1 + \frac{.2}{1.44} \times 10^{-2}\right)^{3.5}$$

$$= 1440 \left(1 + 1.39 \times 10^{-3}\right)^{3.5}$$

This indicates that the stagnation pressure is essentially the ambient atmospheric pressure under these conditions.

The differential pressure will depend on the coefficient of drag, or the turbulence, which will probably require empirical test methods to resolve it.

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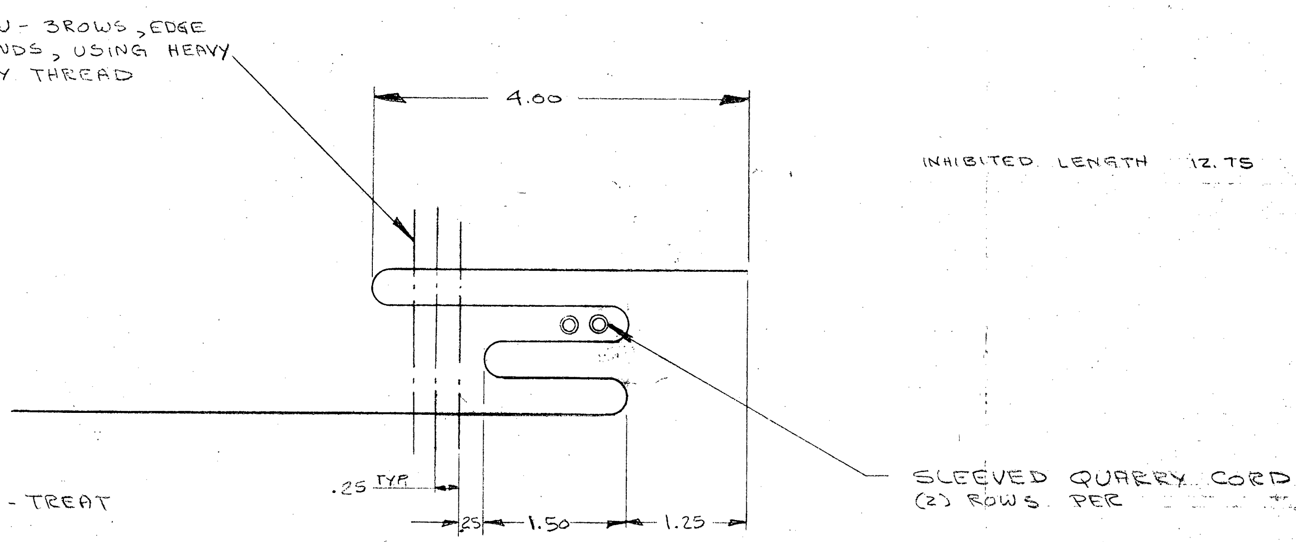

FABRIC - TREAT
PER

No. Req'd	Next Assembly	Material - Size - Specification	Heat Treatment	Surface Finish

	Date		
Customer App'd		TOLERANCES UNLESS OTHERWISE SPECIFIED .xx±.030 .xxx± Angular±	References:
Prod. App'd		Finish Per MIL-STD-10	DO NOT SCALE DRAWING — Issue
Engr. App'd		Drilled Holes Per AND 10387	Weight — Scale —
Stress		Break All Corners Approx. .010 R	
Check	5 Jan 60	Title: SEWING SPEC.	10090

50X1

50X1

DIETRICH-POST CLEARPRINT 1000H

50X1

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E. Preliminary Estimate of Blow Down Test

Duct size 24" x 3"

$A = .5 \text{ ft.}^2$

terminal velocity = 120 ft./sec.
terminal volume = 60 ft.^{3}/ sec @ 15 psia & p = .075 lb./ft.^{3}

flow rate = 60 x .075 x lb. = 4.5 lb./sec.

This flow rate can be related to the nozzle throat and pressure.

$$\frac{P\ \text{down}}{P\ \text{up}} = .528 = \frac{P\,t}{80} \qquad P\,t = 42.3\ \frac{\text{lb.}}{\text{in.}^2} = 6080\ \frac{\text{lb.}}{\text{ft.}^2}$$

Assuming isentropic flow for the above, final specific volume of

$$\frac{1}{.075} = 13.3 \quad \text{ft.}^3/\text{lb.} = \upsilon_{final}$$

then,
$$\upsilon_{throat} = \upsilon_{final}\left(\frac{P_f}{P_t}\right)^{1/k} = \quad = 13.3\left(\frac{15}{42.3}\right)^{1/1.4}$$

$$= 13.3\ (.354)^{.714} = 13.3 \times .48 = 6.33 \quad \text{ft.}^3/\text{lbs.}$$

velocity of sound $C = \sqrt{R\,p/\rho}$ 4.5 lb./sec. x 6.38 ft^3/lbs. = 28.7 ft^3/sec.
$\rho = .00486$ slugs/ft.^{3}

$$\therefore c = \sqrt{\frac{1.4 \times 6080}{.00486}} = \sqrt{\frac{1.4 \times 6.08 \times 10^3}{4.86 \times 10^{-3}}} = \sqrt{1.75 \times 10^6}$$

c = 418 ft./sec.

$$A_t = \frac{ft^3}{lb} \times \frac{lb}{sec} \times \frac{sec}{ft.} = \frac{6.38 \times 4.5}{418} = .0687 \ \text{ft.}^2$$

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$$= .0687 \times 144 = 9.9 \text{ in.}^2$$

$$A_t = \frac{\pi D^2}{4} = .785 \times D^2 = 9.9$$

$$D^2 = \frac{9.9}{.785} = 12.6$$

$$D = 3.55 \text{ in.}$$

Receiver Volume assumptions.

terminal flow is at 4.5 lb./sec.

desired time = 15 sec.

assume with higher initial flow rate this flow would be equal to about 25 seconds @ 4.5 lb./sec.

Total pounds are $\cong$ 112.5

Using ideal gas laws, $pV = WRT$

@ 135 psia = 1.945×10^4 lb./ft.^{2}

$$V = \frac{112.5 \times 53.3 \times 540}{1.945 \times 10^4} = 166.5 \text{ ft.}^3$$

at 80 psia there will be

$$w = \frac{80 \times 144 \times 166.5}{53.3 \times 540} = 66.8 \text{ lbs.}$$ left in the receiver.

Recompressing this, $V = \frac{66.8 \times 53.3 \times 540}{1.945 \times 10^4} = 99 \text{ ft.}^3$

Indicating the receiver volume should be in the order of 300 ft.^{3}

A 5' dia x 14' receiver (275 ft.^{3}) is probably the smallest unit that will do the job. A 5.5' dia x 18' receiver (428 ft.^{3}) would be adequate.

$$CFM = \frac{\text{ft.}^3}{\text{lbs.}} \times \frac{\text{lbs.}}{\text{min.}} = \frac{4.5 \times 60}{.075} = 3600.$$

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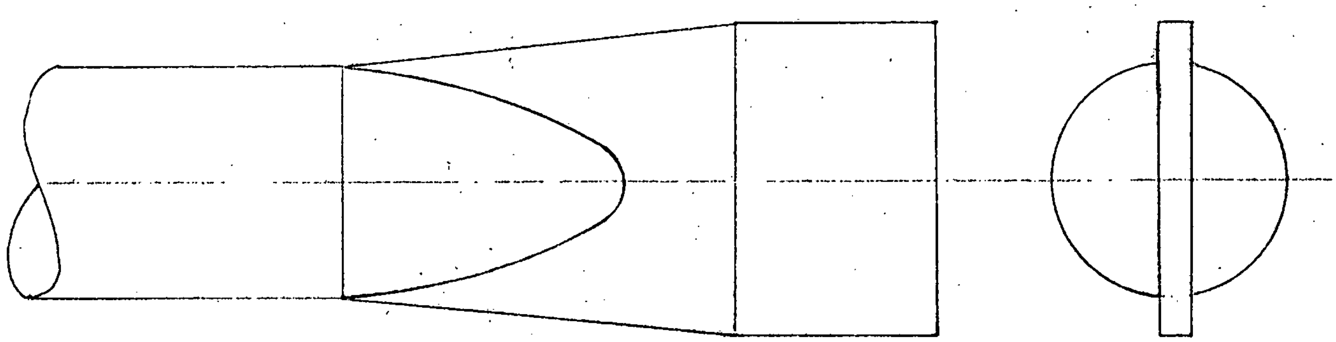
For a 3" x 24" duct, $A = .5$

$$U_s = 90 \text{ mi/hr} = 135 \text{ ft./sec.} = 8100 \text{ ft./min.}$$

$$= 67.5 \text{ ft.}^3\text{/ sec.}$$

$$= 4050 \text{ ft.}^3\text{/min.}$$



Assume pressure loss = $1.5\ h_u$, Velocity pressure = 4.0" H_2o

$$U_s = \sqrt{d\ g\ h}$$

$$135 = \sqrt{64.4\ h} \cong 8\sqrt{h}$$

$$h = \left(\frac{135}{8}\right)^2 = 16.9^2 = 285 \text{ ft.}$$

$$285 \text{ ft. x } .075 \text{ lbs./ft}^3 = 21.6 \text{ lbs./ft.}^2$$

$$12'' \ H_2o = 64.4 \text{ lbs./ft.}^2$$

$$\frac{x}{12} = \frac{21.6}{64.4} = x = \frac{21.6 \times 12}{64.4} = 3.98''$$

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F. Blow-down Set-Up

Criteria -- minimum wind velocity of 80 mph $\cong$ 120 ft./sec through 18" □ duct at the end of 30 seconds.

$$\text{terminal volume flow} = 120 \text{ ft./sec.} \times 60 \frac{\text{sec.}}{\text{min.}} \times 2.25 \text{ ft.}^2$$

$$= 16{,}200 \text{ ft.}^3/\text{min. @ 15 psia}$$

Assume flow is through a 2" dia. orifice, equivalent area $(A_o) = 2.18 \times 10^{-2} \text{ft}^2$

mass flow, assume $\rho_{air} = .075 \text{ lbs./ft}^3$ @ standard conditions

$\therefore 16{,}200 \times .075 = \text{min.} \times \text{lbs.} = 1{,}215.0$ lbs./min

If starting pressure is 120 psig = 135 psia say, assume terminal pressure will be on the order of magnitude of 80 psia, $\therefore$ the receiver.

Then, critical mass flow occurs when $\dfrac{P_{up}}{P_{throat}} \cong 2.0$

$\therefore P_{throat} = 40$ psia

Assuming isentropic flow, $p V^k = C$ $k = 1.4$, evaluating C in the duct.

$16{,}200 \text{ ft.}^3/\text{min.} = 270 \text{ ft.}^3/\text{sec}$

$15 \times 270^{1.4} = 15 \times 2.550 = 38{,}300$

$V_t^k = \dfrac{C}{p} = \dfrac{38{,}300}{40} = 957 \qquad {}^{1.4}\sqrt{957} = 135 \dfrac{\text{ft}^3}{\text{sec.}}$

Assuming sonic velocity is about 1000 ft./sec., then $\text{ft.}^3/\text{sec} \times \dfrac{1}{\text{ft.}^2} = \text{ft./sec.}$

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$$135 \times \frac{1}{A_t} = 10^3$$

$$\therefore A_t = .135 \text{ ft.}^2 \cong 19.45 \text{ in.}^2$$

This corresponds to a 5' dia. orifice. Alter the problem by reducing the duct area. Use a 24" x 3" duct.

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G. Requirements for Erosion Test

V_s = Stripping velocity. Assume = 180 mph

$$= \frac{1.80 \times 5.28 \times 10^3 \times 10^2}{.36 \times 10^4} = 264 \text{ ft./sec.}$$

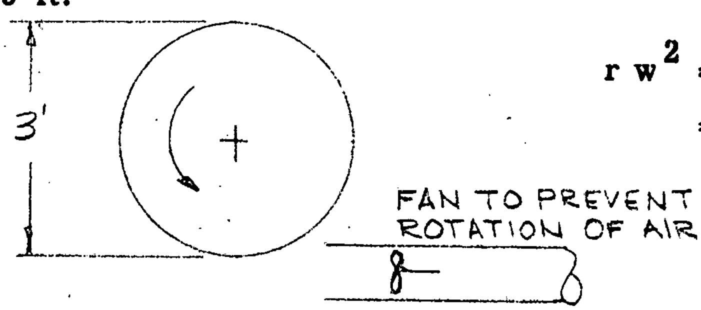
Using a standard 1725 rpm motor, $V_s = r\,w$

$$1725 \text{ rpm} = 180.5 \text{ rod/sec.}$$

$$264 = r\; 180.5$$

$$r = \frac{264}{180.5} = 1.463 \text{ ft.}$$

Let r = 1.5 ft.



$$r\,w^2 = 1.5 \times 180.5^2$$

$$= 48{,}900 \text{ ft./sec.}^2$$

Procedure: Rotate for 3 hours, subject to wind and sand erosion, ignite to observe separation.

$A_n = 48{,}900$ ft./sec.^{2} $\qquad f = m\,a$

Assume $p = 10 \times .0431 \frac{gm}{in^2} = .953 \times 10^{-3}$ lbs./in^2 $= 9.53 \times 10^{-4}$

$$f = \frac{p}{g}\, a = \frac{9.53}{32} \times 4.89 = 1.457 \text{ lbs./in.}^2$$

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H. Test Data for High Temperature Test of Combustible Coatings

1. FFFG Black powder mixed with water and brushed on cotton cloth.

2. Potassium chlorate mixture with bulk powder dissolved in acetone as carrier. Brushed on.

3. Potassium chlorate mixture with cellulose nitrate lacquer as carrier. Brushed on.

12-17-59	Samples were held at 150° F for 2-1/2 hours.
12-18-59	At 8:00 a.m. chamber was turned on and set for 175°F. Chamber was shut down at 3:30 pm.
12-21-59	At 8:10 am chamber was turned on and set for 200° F. Chamber was shut down at 4:30 pm.
12-22-59	At 7:50 am chamber was turned on and set for 225°F. Chamber temperature was stabilized by 8:20 am. Chamber was shut down at 4:15 pm.
12-23-59	At 7:50 am chamber was turned on and set for 250°F. Chamber was stable at 250°F by 8:25 am. Chamber was shut down at 4:05 pm.
12-24-59	At 7:55 am chamber was turned on and set for 275°F. Chamber was stabilized at 8:30 am. Chamber was shut down at 11:15 am.
12-28-59	Chamber turned on at 7:50 am, set for 300°F. Chamber stabilized at 8:45. Chamber was shut off at 4:20 pm.
12-29-59	Chamber was set for 325°F and turned on at 7:50 am. Temperature was stable by 8:40 am. Chamber was shut off at 4:40 pm.

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12-30-59 (Coupons clipped from samples before test.)	Chamber was set for 350°F and turned on at 8:00 am. Chamber was at temperature by 8:45 am. Chamber was shut off at 3:30 pm. Cloth began to turn amber during this test. Sample No. 3 was much the darkest.
12-31-59 (Coupons clipped from samples before test.)	Chamber was set for 375°F and turned on at 7:55 am. Set temperature of 385° was required to hold an indicated temperature of 375°-380°. Internal temperature of 375° was reached at 8:50 am. Internal temperature raised to 385°F at 11:20 am. Internal temperature raised to 390°F at 12:30 pm. Internal temperature raised to 395°F at 1:10 pm. Internal temperature raised to 400°F at 2:00 pm. Chamber shut off at 3:30 pm.

Test was discontinued due to temperature limitations of oven.

Results: None of the samples ignited spontaneously during this test; however, burning characteristics of all samples had degraded significantly.

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I. Summary of Activities up to September 30, 1959.

Checked out various manufacturers of cellulose nitrate sheet material with negative results except for Nixon Nitration Works located in Nixon, N. J. Talked to a Mr. Whiting at Nixon who agreed to mail some samples out. They make one grade only. It runs 11 to 11.8% nitrate. The fuming point is approximately 320°F. It can be purchased in thicknesses of .010 and up.

American Products Mfg. Co., New Orleans 18, La., does not manufacture cellulose nitrate and nMonsanto Chemical Co., Springfield, Mass., has discontinued its manufacture. Another possible source is Joseph Davis Plastics Co., Arlington, N. J. (not contacted).

Some manufacturers do make a cellulose nitrate flake for paint or lacquer use. It may be possible to obtain flake and have it made into a sprayable liquid and laminate our own sheets. This has advantages and disadvantages, of course. We really do not have a place to do this type of work. What happens to fire insurance rates, etc.? On the other hand, we can build in the ignition components if we laminate it ourselves.

Ignition is still a big problem. Straight electrical ignition appears difficult; however, Dale Montgomery of Electro-Film Inc., Los Angeles, (ST. 7-1324 or PO. 5-4420) is working on a proposal for a nicrome wire ignitor. We may have to build in a "fast match" design by cementing gun powder to the back side of the cellulose in a pattern that will assure destruction of the unit. Ignition of the gun powder can be accomplished electrically similar to the old fashioned photography flash gun. This, in turn, should ignite the cellulose.

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Protection between layers might be accomplished by using a fireproof paint that is made with naphthol pitch, similar to fireworks "snakes". When this material burns, it fumes and bubbles and should provide air pockets which will protect the next layer. After combustion, the residue is a dry sand-like substance that will blow away.

Cellulose nitrate will turn yellow if subjected to sunlight; however, since we will paint on both sides, the front with colors and the back with insulation paint, this discoloration should have little effect.

Hercules Powder Co. in Los Angeles makes the cellulose nitrate flakes (DU. 7-8151) as does Atlas Powder Co. Talked to W. J. Taylor at Atlas. Don't try to call DuPont--it is too confusing.

Checking the powder companies for a smoke generating primer which is capable of igniting a mortar base propellant. If this can be obtained in a thin form, it can be applied directly to the cellulose nitrate.

Have requested MIL Specs on 4 types of cellulose nitrate lacquers and enamels. We will have to apply color to the assembly, although it is probably possible to buy decals of the insignia.

Have on file a letter and brochure from V. R. Wilson of DuPont on their Nitro Cellulose as used in the paint industry. It lists information of value in the manufacture of lacquers, etc.

Also have literature on the electrical equipment manufactured by Electrofilm mentioned earlier.

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Contacted Wilson at DuPont for a primer that might be applicable to this project. They make a low energy primer cord known as Pyro-cord which is satisfactory for ignition of cellulose nitrate sheets. He is mailing full information on this product.

Also questioned him for lacquer manufacturers in the area that might make lacquer of cellulose nitrate suitable for spraying to make up a sheet if we decide to go this way. Two lacquer manufacturers were given; however, others are available if these don't prove out:

a. Rinshed-Mason, 1244 W. Lemon St., Anaheim
b. Souther Lacquer, 10017 Burtis St., South Gate

Bob Morgan also states that Trail Chemical Corp. at 1614 Gidley St., El Monte, can make this.

Received information from DuPont on their Pyro-cord ignitors and it looks very good. Can be obtained in sizes down to 1/16 inch diameter and any length. Also has a mild end primer which will work pretty well on this project. These units can also be operated through an aluminum plate which is also very appealing insofar as this project is concerned. Eliminates drilling holes. The primer cord itself can be used to release any outside attachments necessary.

Have been "playing" with Dowty's "Flash pad" paper. It is possible that if cellulose nitrate were sprayed on this paper, marked with colored cellulose nitrate a highly inflammable combination is conceived. Coupled with the DuPont pyra-cord by laying this on the back surface of the cellulose nitrate assembly above, then glueing and sealing with a cellulose nitrate lacquer, the complete package is made up. The pyra-cord should be shaped to provide maximum destructive burning pattern without an explosion.

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Talked to Mr. McCandlish of Hercules Powder Co. They make two items that might work. One item is Quarry Cord which is 3/32" diameter and burns with an open flame at a rate of 1 sec./ft.

The second itemeis Thermolite Ignition cord which is smaller in diameter and slower burning. It is 1/32" in diameter and burnse at 8-10 sec. per foot, or a second spped of 16-20 sec. per foot, depending on the class obtained. It burns with a modified open flame--not as great as the quarry cord.

Either of the above can probably be ignited by photography flash-type electric squibs, but it is usually ignited by flame.

He gave a possible manufacture of photo flash powder as the U. S. Flare Co. (up in the Valley) who manufacture all types of signal flares.

Hercules will submit 10 ft. samples the week of 8-24-59.

Talked to Frank Briggs at DuPont regarding their #506 Sheet Explosive. This is rated in grains per sq. in. and normal is 2-8 gr./in. 2 grain is PN 506 A-2 and is approximately .084 thick. Minimum order is 10 lbs @ $6.00 per pound. He is sending literature and checking on possibility of test samples. (Received literature--too powerful. Checking on thinner sheets.)

Contacted Rinshed Paint Co. in Anaheim and picked up a quart of regular clear lacquer per MIL-L-7178, and a pint of 50% solution of cellulose nitrate and thinner (apparently lacquer thinner).

Contact several paint companies reference fire retardant paint. None were reported= to be fireproof.

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All manufacturers contacted stated that their paint bubbles or foams when exposed to heat creating air pockets which form the insulation quality. Several are submitting samples and complete literature for evaluations.

Barnard Chemical Co., Du. 8-7260, Mr. Barnard
Glidden Industrial Paints, LU. 1-6264, Mr. R. C. Cary
Albi Mfg. Co., CU. 3-1255.
Alumitone Corp., Mr. Miller, Alum. pigments

The last company was contacted for aluminum flakes for pigments for possible coloring of fire retardant paint.

All paint manufacturers report that their fire retardant paint leaves a dry residue which must be wire brushed off. One reports that a 60 psi air hose will blow it off.

Contacted Mr. Dell Lytell of DuPont Special Effects Department and requested information on any item that may be of value to us on this project. He explained that they had a sheet of Pyrotechnic mixture which is used as an ignitor for solid propellant rockets.

This material is approximately 1/16" thick on a mylar or cellulose acetate base and has a very rapid burning rate with a flame of 8 to 10" long. This material is not sensitive to friction and the impact effect is approximately the same as TNT. It does react to flame or electrical squibs. It can be cut by razor blade--compression cutters are not recommended.

Sheet 24" x 34" prices at $48.50. Squibs at 35¢ each. Ordered 6 pcs. Z-17 squibs and one sheet, 3 day delivery. Received 9-22-59.

Also received several sheets 20" x 50" of #3536 clear cellulose nitrate from Nixon. This material is transparent with SS finish.

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Have received the following paint samples:

2 pts. Albi, 107A, Fire & Heat Retardant paint

1 pt. Albi, 99, Fire and Heat Retardant paint

1 qt. Glidden Duo-Tex White, Fire Retardant paint

1 pt. Rinshet-Mason 50% solution, Cellulose Nitrate & Thinner

1 pt. Glidden XXLOL Thinner

Have ordered an airbrush and necessary attachments to build up sample test plates. Also have ordered graduates and glass plates for mixing purposes. When these items are received, experiments will start.

DuPont, Special Effects:

Mailing Address - Box 528, San Fernando, California

Street Address - 12300 Montague Street, Pacoima, California

No published literature available on ignitor sheet.

Ordered additional squibs--1 gross.

Specification No. 364

JOB NO. Task Order K

NAME Identification Panel

DRAWING LIST

NEXT ASSY

DATE 12 January 1961 COMPILED BY JRD CHECKED BY SHEET 1 OF 1 SHEETS

ITEM	PART NUMBER	PART NAME	DWG SIZE	DESCRIPTION	NO. REQ'D		
1	364-500		D	Location & Dimensions - Identification Device			
2	364-100		R	Final Assembly			
3	364-400		C	Element - Forward, Inner			
4	364-401		C	Element - Inner			
5	364-402		B	Element - Aft, Inner			
6	364-403		C	Element - Outer			
7	364-404		C	Element - Forward, Outer			
8	364-405		B	Element - Aft, Outer			
9	364-300		R	Base Panel Assemblies			
10	364-301		C	Actuator Assembly			
11	364-406		C	Components			
12	364-407		B	Fairlead			
13	364-302		C	Cable Assemblies			
14	364-408		B	Cotter			
15	364-501		B	Schematic - Electrical Circuit			
16							
17							
18							
19							
20							

CHG. LTR.	ITEM	CHANGE	BY	DATE	CHG. LTR.	ITEM	CHANGE	BY	DATE

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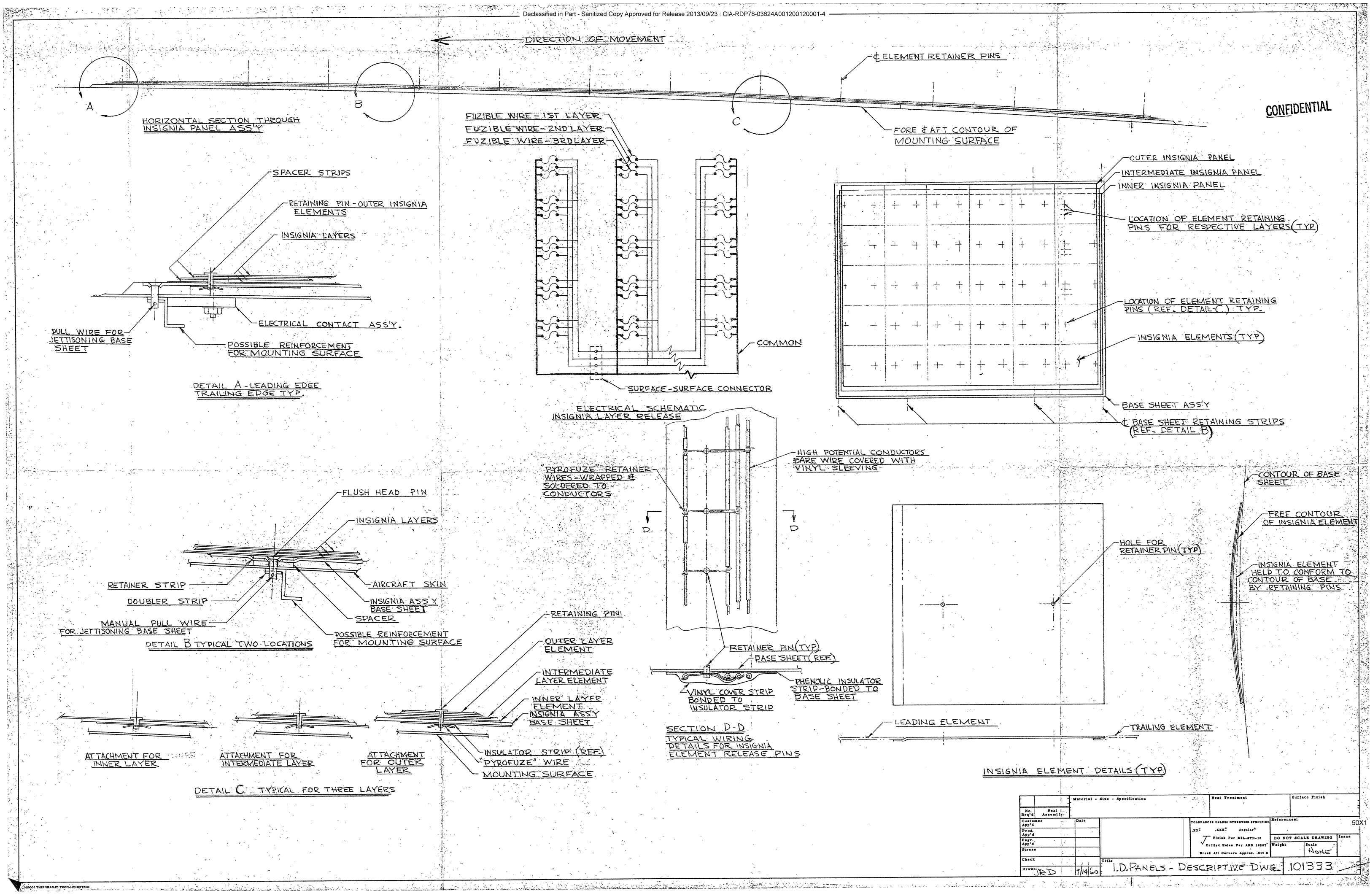
DIRECTION OF MOVEMENT
℄ ELEMENT RETAINER PINS
A
B
C
CONFIDENTIAL
HORIZONTAL SECTION THROUGH INSIGNIA PANEL ASS'Y
FORE & AFT CONTOUR OF MOUNTING SURFACE
FUZIBLE WIRE - 1ST LAYER
FUZIBLE WIRE - 2ND LAYER
FUZIBLE WIRE - 3RD LAYER
SPACER STRIPS
RETAINING PIN - OUTER INSIGNIA ELEMENTS
INSIGNIA LAYERS
ELECTRICAL CONTACT ASS'Y.
PULL WIRE FOR JETTISONING BASE SHEET
POSSIBLE REINFORCEMENT FOR MOUNTING SURFACE
DETAIL A - LEADING EDGE TRAILING EDGE TYP.
COMMON
SURFACE-SURFACE CONNECTOR
ELECTRICAL SCHEMATIC INSIGNIA LAYER RELEASE
OUTER INSIGNIA PANEL
INTERMEDIATE INSIGNIA PANEL
INNER INSIGNIA PANEL
LOCATION OF ELEMENT RETAINING PINS FOR RESPECTIVE LAYERS (TYP)
LOCATION OF ELEMENT RETAINING PINS (REF. DETAIL C) TYP.
INSIGNIA ELEMENTS (TYP)
BASE SHEET ASS'Y
℄ BASE SHEET RETAINING STRIPS (REF. DETAIL B)
HIGH POTENTIAL CONDUCTORS BARE WIRE COVERED WITH VINYL SLEEVING
"PYROFUZE" RETAINER WIRES - WRAPPED & SOLDERED TO CONDUCTORS
D
D
CONTOUR OF BASE SHEET
FREE CONTOUR OF INSIGNIA ELEMENT
HOLE FOR RETAINER PIN (TYP)
INSIGNIA ELEMENT HELD TO CONFORM TO CONTOUR OF BASE BY RETAINING PINS
FLUSH HEAD PIN
INSIGNIA LAYERS
RETAINER STRIP
AIRCRAFT SKIN
DOUBLER STRIP
INSIGNIA ASS'Y BASE SHEET
SPACER
MANUAL PULL WIRE FOR JETTISONING BASE SHEET
POSSIBLE REINFORCEMENT FOR MOUNTING SURFACE
DETAIL B TYPICAL TWO LOCATIONS
RETAINING PIN
OUTER LAYER ELEMENT
INTERMEDIATE LAYER ELEMENT
INNER LAYER ELEMENT
INSIGNIA ASS'Y BASE SHEET
INSULATOR STRIP (REF.)
"PYROFUZE" WIRE
MOUNTING SURFACE
ATTACHMENT FOR INNER LAYER
ATTACHMENT FOR INTERMEDIATE LAYER
ATTACHMENT FOR OUTER LAYER
DETAIL C TYPICAL FOR THREE LAYERS
RETAINER PIN (TYP)
BASE SHEET (REF)
PHENOLIC INSULATOR STRIP - BONDED TO BASE SHEET
VINYL COVER STRIP BONDED TO INSULATOR STRIP
SECTION D-D TYPICAL WIRING DETAILS FOR INSIGNIA ELEMENT RELEASE PINS
LEADING ELEMENT
TRAILING ELEMENT
INSIGNIA ELEMENT DETAILS (TYP)
No. Req'd
Next Assembly
Material - Size - Specification
Heat Treatment
Surface Finish
Customer App'd
Date
Prod. App'd
Engr. App'd
Stress
Check
Drawn JRD 9/14/60
TOLERANCES UNLESS OTHERWISE SPECIFIED
.xx± .xxx± Angular±
Finish Per MIL-STD-10
Drilled Holes Per AND 10387
Break All Corners Approx. .010 R
References:
DO NOT SCALE DRAWING
Issue
Weight
Scale NONE
Title I.D. PANELS - DESCRIPTIVE DWG.
101333

50X1