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ICEY WEST TESTS

JOINT USN/CIA BALLOON LAUNCHING TESTS FROM SUBMARINE

Reference: (a) SR/COP/FI Letter on above subject, dated 3 Jan. 1955.

1. The tests requested in reference (a) were accomplished during the period 28 March to 29 April, in two phases. The Phase I tests were planned to develop, test and select the most suitable equipment and to improve techniques for the Phase II tests. The latter were performed from the submarine, and all landings were sea touchdowns.

2. The test results are the basis for the enclosed report.

Enclosure (1) provides the answers to all of the specific questions in above referenced letter and also contains recommendations.

Enclosure (2) is the report of Phase I.

Enclosure (3) is the report of Phase II.

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CONCLUSIONS

(a) Balloon launchings from submarines are feasible. WW II fleet type, Guppy conversion or new fleet type are suitable. Launchings are considered practicable in surface winds, including gusts, up to 16 to 18 knots. (Encl. (1), para. A-17).

(b) The balloon, gondola and equipment used are suitable for operational use, although modifications to certain equipment, indicated in the enclosures, should be accomplished.

(c) The 302-P balloon, gondola and equipment as carried in the Phase II flights are virtually free of detection by radar but the balloon is visually detectable at 20,000' altitude under some background and light conditions. (Encl. (1), para. A-19).

(d) Weather trajectory forecasting is a major factor in accomplishing a photographic mission. Minimum requirements are contained in Enclosure (1), para. C-1.

(e) Radar photography from 30' balloons is not practical at this time because of size and weight of units and power supply.

(f) Elint equipment, similar to the type carried on first submarine launching, can be employed in balloon photo-overflights.

RECOMMENDATIONS

(a) Install 24 trailer type helium bottles or, as next best system, install 120 standard bottles laid flat, in forward torpedo room. At least 5 additional standard bottles must be carried for weather balloons. (Enclosure 1, para. A-1)

(b) A radar-picket submarine should be used for launching, if one can be made available. (Enclosure 1, para. C-1 C(2)(b)).

(c) If time permits, develop a rawin system for use in submarine and in "special operational forecast center" ship. (Enclosure 1, para. C-1, C, (2)(b)).

(d) Develop a meterological balloon and radar reflector combination, with a known rate of rise, for use where rawin not available. (Enclosure 1, para. C-1, C, (2)(b)).

(e) Have balloonist use an AN/PRC-14 radio, with ground plane antenna. AN/PRC-10 is substitute but inferior. (Enclosure 1, para. E-6.)

(f) Modify the VHF beacon for increased power, waterproof packaging and improved cycling. (Enclosure 1, para. F-2, a.)

(g) Develop an MHF beacon for use after landing. (Enclosure (1), paras. E-6 and F-2.b.)

(h) Insure that any portable D/F equipment in tracking vessels is calibrated carefully after installation. (Enclosure (1), para. F-2, a.)

(i) Accomplish additional work on modified K-20 cameras to improve their performance, because adequate time was not available prior to the Phase I and II tests to do fully satisfactory modifications. (Enclosure 1, para. B-2).

(j) For water landing, a normal landing should be made, with the pilot immediately getting clear of balloon gear, getting into water and inflating and using his rubber boat. Necessary equipment and records are preserved in watertight containers.

Enclosure (1)

TSS REPLY TO SPECIFIC QUESTIONS IN SR/COP/FI LETTER DATED 1/3/55

A. Submarine Launching Problems

A-1. The problems of gas storage aboard the submarine. (Can the 15,000 cubic ft. of gas be carried in a high-pressure air ballast tank of the submarine or must the 60 bottles of gas be stored within/ without the pressure hull?)

Storage of helium aboard a submarine is not a difficult one. Several alternative methods, some of which are simpler than others, are available, as follows:

ENC. 1

a. Install 60 standard bottles on each side of forward torpedo room, shored up with two-by-fours, the bottles being laid flat with tops inboard. This is one of the two best methods. If bottles are stood upright, four by fours are required and greater loss of torpedo stowage and bunk space results. Bottles can be struck down the hatch and removed by use of the submarine davit and jigger tackle (3 fold). This requires 2 men on deck and 1 man below.

b. In lieu of 60 standard bottles, 12 longer, slightly larger diameter, 8.68 cu. ft. volume trailer type bottles could be used. This would allow one of the five standard manifolds to suffice. About 14 could stow below the torpedo room deck, and 10 more on one side, for two launchings. Advantages would be less handling of bottles and one side of torpedo room, above the deck, not disarranged. This method is best, but requires some special pigtail lengths to connect a manifold.

c. Use the submarine's forward high pressure air bank for helium storage. This can be done best by breaking the H.P. line just inside the pressure hull, installing a three-position valve at the break ("off", "air manifold" and "helium charging - supply"). This requires one or two days work by tender or base. However, if charged to 3000# pressure, one bank can inflate 2 balloons. (25,000 ft.^{3} will inflate 2). An other method is to charge and supply helium through the submarine's outside charging connection, but this requires that all other air banks be shut off the manifold during time helium is being charged or supplied; this is poor submarine practice because H.P. air is not quickly available and might be needed.

d. A suggested method was to charge 10 of the torpedoes, in forward torpedo room, with helium before departure from base. This would require use of a manifold. Ten torpedo flasks would suffice for 2 balloons. After use of helium, flasks might be charged with air as usual. This system offers desirable features but the engineering problems in air flask valving arrangement appear complex and it is improbable the Bureau of Ordnance would allow it.

e. Stowage of helium bottles in the superstructure: This should not be done, because of action of salt water and seas against valves and allied difficulties.

Comment: Where 60 bottles are used for each launching, it is important that they have at least 2200 lbs. pressure, in order to provide sufficient helium. Additionally, sufficient bottles must be carried for launching of meterological balloons.

A-2. What are the problems of stowing helium or hydrogen?

There are not outstanding problems attendant upon the stowage of helium in a submarine.

Hydrogen must never be stowed in submarines - primarily because of its explosive qualities if leaks develop.

A-3. What are the problems of manifolding the gas and must the submarine be modified in any manner to provide more expeditious manifolding to inflate the balloon rapidly?

Manifolding the gas poses no particular problems. The present manifolds are adequate for the 60 bottle array in both vertical and horizontal positions. They would also suffice if 12 of the trailer type bottles were used, but some of the pigtails would need to be longer.

A-4. Where may the meterological balloons be inflated? What are best release points? Where can the maritime theodolite be mounted to provide the best observation of the meteorological observation balloons?

Meterological balloons should be inflated and released on the superstructure deck, ordinarily forward of the bridge structure with zero wind over the deck. However, where this wind condition is not entirely possible, they may be inflated and released in the lee of the conning tower fairwater, at the after end.

The maritime theodolite should be mounted on the forward superstructure deck, which is normally drier than the deck aft.

The use of a theodolite requires visual sighting at all times to realize any value. If the balloon is obscured by a cloud, or at night, the balloon light lost against the stars, the run would have to be repeated consuming time on the surface. This situation becomes critical where cloud decks and fog are prevalent over sea areas. Using a balloon with 1000 ft/min. rate of rise requires 20 minutes from time of launch to get a satisfactory run to 20,000 ft. Total time for a pibal including inflation requires 30 minutes.

During the tests visual night pibals were run to 13,000 to 14,000 ft. but several were lost against the stars. It was found possible to use the submarine air search radar, which was not a "nodding", height finding type, to track the weather balloon at angles of elevation up to about 65°. A 500 g. balloon with an RR-32 radar reflector was tracked to 8000 yds in 15 minutes and reached an altitude of about 12,000 ft. 500 g. balloons with two radar targets (RR-32 and ML-306) were launched and were easily tracked to a range of 44,450 yds. in 28 minutes. With targets attached to the balloons a suitable accurate rate of rise could not be predicated because of the drag of the targets.

A-5. What training of sub-crew or officers is necessary for meteorological observations or personnel balloon launching?

For meterological observations, it is recommended that 1 officer aerologist and 1 enlisted Chief or first class aerographer's mate be embarked on the launching vessel and one chief aerographer aboard a recovery DER. Further training would consist primarily of working out a mutual understanding between them and the officer of the deck as to best courses and speeds for existing wind and coordination of the moment of launching so that the submarine will be on the correct course and speed for observations. In addition, they should prepare a table of the data required from the submarine personnel - time, relative radar bearing, true radar bearing, radar range, ship's head, ship's speed over the ground. This requires that the radar be warmed up in advance, that at least two stopwatches be started upon release, and that one person call out 5 second warning and "mark" on each minute, in the conning tower or control room, so that more accurate readings may be obtained. It is obvious that a small amount of training is needed. The principal requirement is selection of the best radar man for the radar, a good steersman for a steady course, and an able recorder. The aerologist and his assistant can handle the theodolite, assisted by 1 or 2 submarine personnel in leading up the helium line.

For personnel balloon launching, 1 fully experienced balloon technician and 1 balloonist are the minimum. However, an assistant ground crewman is highly desirable. The case officer should perform this duty. Additionally, 4 enlisted men of the crew should be trained, enroute to the operating area, in handling the helium valves below decks, bringing up and laying out the equipment in proper order, and assisting at the gondola and in inflating. The Captain should be on the bridge throughout inflation and give his best efforts to keeping a zero relative wind, or practically so, until after the balloon is away.

A-6. What deviation from normal submarine operating conditions will be necessary?

Deviations are not of major importance. There will be a reduction in the number of torpedoes in forward torpedo room, and slight reduction in berthing space. However, depending on arrangement for helium, submarine personnel may be unable to work on certain torpedoes until after the balloon launching. Also, once the submarine commences inflation, it is committed to a set course and speed for the next 30 minutes, until after launching, unless an emergency such as detection makes cutting loose and diving advisable.

A-7. What emergency measures can be anticipated which might affect the launching?

Covered in last part of A-6.

A-8. What goods or services are necessary or must be provided by the Navy or the submarine?

The Navy must provide the submarine, messing and berthing facilities thereon for 5 men, must provide any tracking or recovery craft, communication facilities with shore base, and it (or Air Force through Navy channels) will provide from shore base the basic weather information.

As previously indicated, 4 submarine enlisted men will be sufficient to assist in launching. They can be trained enroute to the operating area, and this will not interfere with their regular duties on board.

A-9. How will the 25" hatch dimensions affect the launching, stowage, packaging and handling of our balloon and photo equipment?

Two items of balloon equipment used for the tests required modification to pass thru the 25" hatch. They were (1) the gondola floor and (2) the balloon package.

The gondola floor was specially constructed and hinged so that it would fold in half along the long dimension and readily pass thru the hatch. The balloons were repackaged in cartons 16 x 16 x 48 inches or 22-1/2" on the diagonal and were easily handled thru the escape hatches. In addition, the balloons were packed with the harness at the bottom end and the valve on top. This packaging allowed easy access for inflation. The normal procedure of tearing down the sides of the box facilitated easy attachment of the gondola and stretching out the top of the balloon to the point where the inflation duct was accessible (approx. 15 feet) with the remainder of the balloon still accordion folded.

The restricted hatch size necessitates proper organization of personnel and material at the time of launch when speed is essential to the operation. Items of equipment must be laid out in a definite order and passed thru the hatch in proper sequence.

A-10. How and where may the equipment be stored and how will it affect the torpedo load or normal stores carried by the submarine?

Sufficient material for two launchings was stowed in the submarine for each test flight. Materiel and equipment for one flight and 125 standard 1.53 ft. helium bottles, enough for two flights, were stowed in the forward torpedo room. All spare equipment was stowed in the after torpedo room. In addition, some boats have had a ballast tank converted into storage space that could be utilized.

The forward torpedo room is rigged to accomodate 16 torpedoes and 16 bunks. With 120 standard bottles installed horizontally (lying flat) 15 bottles long stacked 4 high on each side and cribbed in place, two bunk spaces and four torpedo spaces are lost or utilized for the bottles. The horizontal stowage of the standard helium bottles is the only method recommended for these bottles. The use of the hi-pressure air flasks on the torpedo is not feasible because the torpedos will be unserviceable after this type usage because of damage to the check valve and BuOrd probable disapproval. Other information on helium provided in answer to para A-1. 50X1

A-11. What are the problems of billeting and subsisting [redacted] 50X1

In addition to regualr crew, submarine must billet and subsist:

1 officer aerologist
1 CPO or 1st class aerographer's mate
1 balloonist
1 man in charge of ground crew (balloon launching)
[redacted] 50X1

This number of men will not pose any real problem to the submarine, although cots and possible "hot bunking" will be necessary.

A-12. What emergency repair or fabrication facilities are available?

A small machine shop, tools, electronic repair kits, etc. are on board the submarine. However, there is no foreseeable requirement for emergency repair or fabrication facilities. Adequate spares of all equipment required should be carried.

A-13. What are the problems of maintaining a radar watch during the launching? Can an electronic counter measure (ECM) check be maintained during the launching? Can they both be done simultaneously?

Radar and ECM watches can be maintained simultaneously during the launching. However, security factors may limit the use of radar.

A-14. In poorly charted waters, what operating depth of water is required by the submarines of COMSUBPAC?

This will depend on the type of operations and importance of the mission. Generally speaking, a submarine can operate on the surface with 20 ft. of water. However, it is almost inconceivable that it would be sent to an area with less than 10 fathoms depth, and at least 100 fathoms is desirable. 10 fathoms allows it to lie on the bottom but does not allow sufficient depth to run at periscope depth. It is possible that it would be sent to an area where it might have to operate for short periods in depths of 20 to 50 fathoms, but this gives it poor protection in evading anti-submarine forces.

A-15. What underwater sound gear is available on the submarines?

A variety of underwater sound equipment is on board submarines. The principal types are:

a. Long range listening (passive). These employ various types and arrangements of hydrophones and are installed on a limited number of submarines.

b. Short range listening (passive). Installed on all submarines.

c. Active types. Scanning, echo-ranging, and also incorporating listening features. Installed on all submarines.

d. Underwater telephones, of fixed and portable types. Installed on all submarines.

e. Fathometers. Installed on all submarines.

A-16. What are the electrical voltages and types of electrical current available on the submarine?

Practically all the common types of AC and DC electrical supply are available. These are used in main, auxiliary, lighting, radio, radar, sonar and fire control supply systems.

A-17. What are the problems of running with the surface wind during launching and from where should the balloon be launched-forward or abaft the conning tower? What are the difficulties of laying-out the balloons during launching or must the balloon be stretched out as in a land launching?

It is necessary to run with the wind from the time inflation begins until balloon is launched. This requires some sea room inasmuch as a submarine could advance as much as 10 miles during this period, although usually well under that distance. Ability to dive during this period is also important, hence depth should be over 15 fathoms and preferably over 100 fathoms. It is

considered that a wind speed of 16 - 18 knots is the maximum in which launching can be made, and submarine should maintain zero relative wind after inflation begins.

The balloon should be launched forward of the conning tower because this is the dryest part of the deck with a following sea.

With the special packaging that was employed, it was necessary to lay out on deck only the upper 15 feet of the balloon, i.e., from the peak down to the junction of the inflation duct. This method is recommended.

A Fleet type submarine and a guppy conversion have adequate deck space for the launching. These comprise the great majority of the vessels in commission.

A-18. What is the absolute minimum time necessary to make a secure darkness inflation and launching of a 302-P balloon - from "surface" alarm to "dive" alarm?

One hour. This allows a few minutes leeway.

A-19. How far and to what altitude can the submarine track the balloon on its radar scope after the launching?

The radar is not likely to detect the balloon. However, if the elevation angle is less than 65°, the radar may detect the balloon as far as 4 miles.

A-20. What are the special problems of cold water submarine operation - in water temperatures of approximately 38°F?

There are no special problems of cold water submarine operation in water temperatures of approximately 38°F.

A-21. If the sub has been picked up on a shore radar scope, how far away can it be spotted and what does it look like on the shore radar scope during the balloon launching phase? (By this we would like to determine if the shore radar station could unquestionably determine that the sub launched a balloon.)

It would be impossible for the shore radar station to determine that submarine had launched a balloon. The balloon would not be detected at distances of 10-20 miles.

This question may be viewed from a security standpoint where the necessary information should be obtained from Air Force ECM surveys or the requirement established for ECM surveys of the areas of concern. This information should provide answers to (1) What radar is utilized in the area? (2) What

frequencies do they operate on? (3) What are the locations in the area? (4) What elevations are the radar sites? (5) At what ranges do these radar have the capability of detecting the ship? With answers to the above questions, then the vessel can operate beyond the range of detection and a determination made as to the feasibility of covering the target areas.

A-22. What other factors must be considered in the submarine launching phase?

No unusual problems were evident in the submarine launching phase. Operationally it may be anticipated that a sub in cruising will have the deck guard rails removed. During darkness, for the safety of personnel on deck, it is recommended that, prior to entering the operating area, the forward guard rails be installed for the period required.

B. Photography Problems

B-1. How many aerial type cameras could or should be taken?

One aerial camera for verticals and one for obliques should be carried in the gondola. The latter is needed to provide target coverage from a lateral position because of difficulty of precisely predicting a balloon track to place it directly over the target. (In addition, two spare cameras should be available in case of mishap during transportation, etc.).

B-2. What type of camera or cameras should be utilized?

One modified K-20 with 6-3/8" lens and one modified K-20 with 15" lens should be used. The vertical camera has the 6-3/8" lens and should be modified to record automatically on the film by means of an electrical and optical system, the hour, minute, second, day, month, date, altitude, temperature and horizon with forward and after views. This last is obtained by two mirrors with optical system at angle of 45° to 6--3/8" lens. The camera for obliques has the 15" lens and should be modified as above except that the horizon optical system is omitted.

B-3. Will the camera be compact enough to be operated in the confined area of a balloon gondola?

Yes.

Is a camera bracket or swivel mount possible?

Yes.

Would an opening in the gondola floor be practical for vertical exposures?

Yes.

B-4. Will the camera require a power supply to operate the camera or provide interior heating for the film and camera mechanism?

Yes and No. The changing of film after each exposure is accomplished by hand by pushing a lever forward and returning it; this hand operation places new film in position and also actuates a series of electrical switches that are synchronized to the camera trigger. When the camera trigger is pressed to make the picture, several small flash light bulbs flash against mirrors which reflect the instruments readings thru an optical system. The record is photographed at the instant the photo is made on the four inch side of negative. Four (4) small mercury cell batteries supply the power. If the ambient temperature is fifteen (15) degrees below zero (F.) the film no doubt will crack and shatter; also the springs in the camera may break. Cameras operating in low temperatures should be heated internally to guarantee proper functioning.

B-5. Will the shutter/trigger operation be simple enough to be operated by the gloved hands of the operator?

Yes. The K-20 camera is a standard military aerial camera and was selected to satisfy the above questions.

B-6. Will night photography or photography in poor light be possible?

Night photography is possible by dropping large flash bombs. The Air Force has such a system, but it does not appear to be practical in a mission of the type under question.

Photography in poor light is possible by using Tri-X film and it is possible to get a readable negative prior to sun-up and after sundown.

B-7. What filters are required and will they be so modified as to provide ease of adjustment and removal?

Two (2) filters are provided. One (1) Minus Blue which is a yellow filter for light haze. The other is a 25A which is a red filter for a thick or heavy haze.

There is no adjustment to make with either filter except to increase the exposure time. If the normal exposure is 250th second, F 16 without a filter, increase the exposure to F. 11 with the Minus Blue filter and with the 25A filter increase the exposure to F 5.6. Both filters are easily snapped on or off the lens.

B-8. What means could be employed by the operator to overcome clouds, haze and poor photography over the target area?

Regarding clouds, there is no means for the operator to penetrate clouds or fog. Regarding haze, the operator should be able to determine with his eyes which filter to use. A simple rule is - if he can see the target

and distinguish objects on the ground through a small amount of haze, use the Minus Blue or Yellow filter. If he has difficulty in distinguishing objects through a heavy haze use the 25A or Red filter.

B-9. What type of film will be utilized?

Two (2) types: Super XX Aerographic, and Tri-X

If the operator plans on going over the target at dawn or dusk or during the very early morning or late afternoon he should load the cameras with Tri-X. If he plans on any time between two (2) hours after daybreak and two hours before dusk he should load his camera with Super XX Aerographic.

B-10. What photogrammetry gimmicks should be utilized to achieve stereo effect, the proper overlap, measurable tilt, indicate drift, etc.?

A standard aerial photographic viewfinder, designed for the proper size camera format, is all that is necessary for assuring proper stereo-overlap.

To assure good tilt determination, with the 15" camera, the following procedure is recommended:

It is unlikely that the horizon will be exposed on the format of an oblique photo due to the narrow cone angle. Therefore, the photographer should note an object imaged near the top of his viewfinder as he exposes his photo. Then, he should expose another, this time placing the object near the bottom of the viewfinder. This procedure should be repeated until the horizon is imaged in the viewfinder. The remittant series of photos will enable the photogrammetrist to reconstruct the successive depression angles and thereby determine the spacial geometry of the desired photo, for measurement purposes.

Drift ("crab") is no particular problem, provided that the camera is kept oriented with the side of the photographic format parallel to the direction of movement of the craft.

B-11. What information is required in order to compile an adequate photo flight log?

The flight log is almost an unnecessary item, photographically speaking, with the instrument recording in the film.

Additionally, the following should be recorded:

f-stop numbers used
Shutter speeds
Film type and speed
Altimeter correction factors, if any used
Filter types used
Type of time recorded on clock. (GCT, LCT, etc.)

Impressions of photographer regarding weather and lighting conditions during photographic run
Record of any difficulties or malfunctions experienced, keyed in by time for comparison with photographic results.

B-12. What waterproofing, moisture proofing, or insulation of the camera will be necessary?

As for water and moisture proofing, the camera - None.

As for insulation, ordinarily none will be necessary, however, if the weather is extremely cold an electrically heated pad over the working parts which transports the film is a good precaution to prevent film shattering and camera failure. A decrease of $3\frac{1}{2}^{\circ}$ temp. F. for each 1,000 ft. alt - subtract this from ground temp. for approx. temp at desired altitude.

B-13. What type and how much training will be required to qualify the balloon pilot/photographer?

In view of the fact that the entire mission is designed to obtain photographs of the target and that only certain cameras, films and filters will be used, it would be necessary to thoroughly train him with this equipment only and not attempt to confuse him by discussions on optics, chemistry, color, etc.

Five (5) days is considered enough time to train the average person in how to read light meters, understand different speeds of film, how to determine what filter to use and adjust the iris of the lens to compensate for the filter. How to take precaution against finger prints on lens or filter, how to load - unload and operate camera, and the precautions necessary in handling unexposed and exposed film.

B-14. What would be the total weight allowance for photographic equipment for photography at 5,000 ft., 10,000 ft., 15,000 ft., 20,000 ft.?

The photographic equipment necessary to accomplish photography at altitudes ranging from 5,000 ft. to 20,000 ft. would be the same in all instances. The only significant difference in the photography would be the smaller scales resulting from higher altitudes. At 20,000 ft. the photo-scale is one-fourth that of 5,000 ft. altitude.

If it is determined that insulation or heating of the camera equipment is necessary at 20,000 ft., depending upon meterological studies, and not at 5,000 ft., and the craft will fly at 20,000 ft. during the photographic run, then this is an item whose weight should be considered for the higher altitudes.

Other than this possible supplemental item of insulation or heating of the gear, no additional photographic equipment is necessary at increased altitudes.

B-15. How precise must the photography be? Should it satisfy strict photogrammetry specifications?

For all indicated uses of the photography which will be accomplished on the mission, the proposed camera installation should provide the precision necessary. The instrumentation and the photography should provide sufficient data for reconnaissance type measurement and interpretation.

The cameras to be used are not precision cameras, nor are they designed to yield cartographic-quality photography. They were designed to furnish rapid, adequate, photographic results when properly used.

It is believed that the cameras selected for this particular project will quite adequately perform the task required of them.

C. Meteorological Support

C-1. What amount and kind of weather information is necessary to prepare a balloon flight plan for a balloon infiltration or a balloon photo-overflight?

The accuracy of a predicted balloon trajectory or track is directly dependent on the accuracy of all available meteorological information and the stability of existing conditions. Over extensive water areas, observation reports are very limited and in some areas are non-existant. The extensive data available only at the weather centrals is utilized, and to fill in, the weather central extrapolates this data for a pressure pattern, air mass, etc. analysis as a basis for forecasting. Because of these unreported areas the importance of local meteorological observations from special operational forecast centers aboard the launching and recovery vessels is great. To provide continuity and a historical sequence for a more complete understanding of the weather situation it is recommended that the aerologists aboard the launch and recovery vessels (operational forecasters) be provided with the international coded weather messages transmitted by radio for plotting 12 hour weather charts. With the weather charts, the weather central forecasts, local observations and local upper air soundings the aerographer (operational forecaster) can then make a final determination of the feasibility to launch and the launch position for a trajectory to cross the target area. The term weather central as used herein is the center that will perform the weather analysis and provide the forecasts for transmission to the launch and recovery vessels. The special operational forecast centers will be aboard ship in the operating area on the launch and on one recovery vessel.

The following are the meteorological requirements considered necessary for isolated area balloon operations for a maximum error of 20% of the range. Assuming no data is normally available from sources near the operating area and the operation area is far from a weather center, the general requirements are:

A. Weather Central Forecasts for Transmission:

(1) The Synoptic situation of operational area.

(2) General forecast of operational area for planning purposes.

(3) Best possible specific wind forecasting for operational purposes.

(4) International coded weather messages for widespread areas surrounding the operating area.

B. Special Operational Forecast Centers:

(1) Receive and plot weather data and maintain weather charts in continuity for local forecasting and evaluation of weather central data on basis of local situation.

(2) Wherever possible, receive upwind and downwind surface and upper air data from ships or stations, on regular basis (every 6 hours) for local forecasts.

(3) Perform upper air observations.

(4) Prepare forecasts used for final positioning for launch and recovery.

C. Observations, Including Techniques Used:

(1) Upper air observations at 6 hr. intervals from:

(a) DER (recovery control) downwind from launch vessel

(b) Launching vessel observations

(c) Ship 100 miles upwind (when possible)

(2) Techniques for upper air:

(a) Pibal- Simple pilot-balloon by optical means. Successful runs are limited by clouds (fog, etc.) and the visibility of an attached light for night shots. Pibals are normally only used for low level observations and are used to augment or where Rawinsonde equipment is not available. The stations using pibals only report to a cloud base and in most cases not beyond 20,000 feet with good visibility and well experienced operators. The AF has practically discontinued the use of pibals for upper air soundings.

(b) Rawin- The simplest system is a sounding balloon and radar target with a known rate of rise. During the tests single targets did not provide sufficient radar return for adequate range. Therefore, the sounding balloon and two targets (RR 32 ML 306) were used and provided sufficient return for ranges up to 35 miles. Using two targets on the balloon resulted in excess drag that changed the rate of rise from the calculated rate. To make this system useable, additional tests will be necessary to arrive at the free lift required to give reproducible&consistent known rates of rise. This system with a known rate of rise plus the use of height finding radar will produce good data. Another system for use with height finding radar would utilize a simpler radar transpender with the proper matching frequency and should be reasonably accurate. A more sophisticated system would utilize a radar transpender and altitude telemetering. The telemetered altitude will be subject to variations with the standard atmosphere plus linkage error, reading accuracy, hysteresis of the calibrated unit, but will provide good accuracy when averaged against the results of the height finding radar. If the above latter two systems are not used with height finding radar, tests will be required to establish free lift data for reproducible fixed rates of rise using packages of similar size and weight. In any case, additional work and testing will be required on the radar systems because the urgency of this test did not allow sufficient time to develop these systems. Because of the limitations of pibal soundings a rawin system and a picket submarine with height finding radar is recommended.

D. Weather Analysis Needed:

(1) Weather Central:

(a) Performs complete analysis of the overall weather system using the extensive information available to provide advisories to the special operational forecast centers aboard ship.

(2) Special Operational Forecast Centers:

(a) Perform comparative analysis and evaluation of weather central data based on local observations.

(b) Draw stream flow charts for each upper air sounding for the operational area for the levels to be used, for historical analysis.

(c) Draw prognostic charts for 6 and 12 hr. verifications. These will be utilized for selecting launch point. Final launch position should be selected on the basis of a final RAWIN from the launching vessel.

E. Other Considerations:

(1) The recovery vessel special operational forecast center provides upper air data for transmission to the launching vessel and the weather central.

(2) Prognostic charts and last upper air observation on the recovery vessel special operation forecast center will be used for positioning the recovery vessels relative to the predicated trajectory plotted from the transmitted launch position and the resultant forecast landing point. After the balloon flies about 100 miles beyond the target area and the DF beacon is turned on, the recovery vessels should then be required to take simultaneous cuts and plot the track to make final estimate of the splash point and close in to make the recovery. Best possible forecast positioning (by prognostic chart) will assist in speedy recovery. If landing on land is planned, the above is modified as necessary.

(3) Personnel:

(a) It would be preferable for aerographers' mates, for taking upper air observations and plotting weather charts, to be stationed on three recovery vessels. However, as a minimum, it is acceptable to station one aerographer's mate on the DER (senior control recovery vessel). It is to be understood that the number of tracking-recovery vessels must be selected on the basis of the situation - the area, sea room, prevailing winds, proximity to land, etc. The number may be three, or two for smaller areas, or less if the chance of landing at sea is minor or nil and it is planned to land inland. Wherever feasible, at least one search-tracking plane (P2V, P5M, etc.) should be provided.

(b) One aerological officer and one chief aerographer's mate should comprise the special operational forecast center on board the launching vessel.

C-2. What is the type and nature of commo required between the submarine and the weather station to support such balloon operations?

The submarine while in the operating area will be required to maintain radio silence to prevent disclosure of its position. However, submarines can copy Navy "Fox" circuit broadcasts while submerged at or near periscope depth and consequently all information described in C-1 from a weather central can be transmitted in this manner. This requires that the submarine maintain a continuous radio listening watch. The only submarine transmission will be a short coded message giving the launch time and position, which is absolutely necessary for the recovery vessels.

E. Communications

E-1. What commo means can be utilized to blind broadcast meteorological information to the submarine without attracting undue attention to our operation?

The blind transmission of weather information could be handled over Navy "Fox" circuits such as NPN, NPM, etc. Although these transmissions would undoubtedly be monitored by unfriendly sources they would be so interspersed with normal Navy traffic that they should attract no undue attention.

E-2. What means can be utilized to securely ascertain the location of the submarine without disclosing the existence of a submarine in the area?

Normal celestial and Hyperbolic navigation, along with possible occasional use of fathometer equipment, appear to be the only secure means. Hyperbolic navigation could, of course, only be used within the range of existing LORAN stations.

The submarine would have to break radio silence to transmit a position report and this should be done only after launch, primarily for information of the recovery vessels.

E-3. What means can be utilized to broadcast operational directions to the sub?

Operational directives should be blind broadcast to the submarine through enciphered messages over "Fox" circuits.

E-4. What means can be utilized by the sub to notify the base that the balloon has been launched?

The submarine would need to break radio silence to transmit enciphered notification of the actual launch position and time, primarily for information of the recovery vessels.

E-5. Will a secure means of commo with the balloon be possible?

No method offers a secure means. As for radio, it must be remembered that no transmission is, in itself, immune to detection and/or D/Fing. The VHF and UHF spectrums do, however, permit a certain degree of security in that their propagation characteristics are primarily line of sight, and thus transmissions are detectable only within a limited distance from the radiating source.

E-6. What voice, C.W. or beacon equipment will be carried to effect a recovery?

The following is recommended:

a. Voice commo, balloon - surface	-	One (1) AN/PRC-14 or AN/PRC-10, each modified with ground plane antenna.
b. CW	-	None.
c. Beacon	-	1 VHF for use aloft and 1 MHF for use in emergency aloft and on the water or ground. MHF beacon could be developed within 1 month and replace the unwieldy Gibson Girl.

E-7. Will the radar proofing of certain metallic objects in the gondola be possible?

Not at the present time. However, this should be explored further and on a continuing basis. Previous radar proofing materials such as ceramics are extremely heavy and cumbersome, however, new developments in this line may make radar proofing feasible for this type of operation.

50X1

F. Recovery and Other Aspects

Preamble:

For tracking and recovery where large sea areas are involved, three recovery vessels (DE or larger) and one or two long range planes (P2V, P5M, etc.) are highly desirable. At least one vessel should have height finding radar if possible. When sea areas are smaller, when the balloonist is expected to touch down on land, the number and type of ships should be adjusted in accordance with the reduced requirements. Likewise, the tracking aircraft may be eliminated in some cases.

F-1. What radio commo means, channels, frequencies etc., will provide secure commo for recovery?

There is no secure means, as previously discussed. Tests have shown that either the HF AN/PRC-10 or the UHF AN/PRC-14 is usable for air-surface voice commo. Both units require slight antenna modification. (Suitable ground planes). Since the AN/PRC-14 is compatable with naval shipboard and aircraft commo gear both from the standpoints of frequency range and mode of modulation, it is believed to be the unit best suited to operations where sea recoveries are anticipated. On the other hand, for land recoveries the AN/PRC-10 would be the more likely unit since it can operate with readily available portable ground units.

F-2. What secure beacons or location aids will improve chances of recovery?

There are no secure aids, as previously stated.

a. The small VHF beacons used during the tests functioned satisfactorily with line-of-sight ranges to 75 miles with a power output of approximately 0.4 watts and indicated the feasibility of using a low power VHF beacon. Additional modification and development should be accomplished to provide an improved compact, lightweight beacon with identification cycling device and more power output to improve the quality of the signal for the recovery vessels to D/F on during the latter portion of the balloon flight. This VHF beacon should have an output of 0.8 to 1.0 watts and be completely self-contained in a waterproof unit with an operating battery life of at least 12 hours. To track the VHF beacons requires the installation of AN/URD-2A VHF D/F equipment on the recovery vessels. After the installation of this D/F equipment, it is necessary that each vessel run calibration tests on the equipment and installation through 360° as well as verification tests from known positions to provide accurate and good quality bearings using the corrections indicated on the derived calibration chart. The VHF beacon for use on the surface is not considered desirable because of the line-of-sight characteristics limiting the range to less than that achievable by the ship's radar on a portable radar target.

b. The MHF (1676Kc) beacon, used during the tests primarily for aircraft tracking, had an output of one (1) watt and used in conjunction with the AN/PRD-1 portable HF D/F equipment installed on the vessels gave good quality long range bearings but because the sets were not accurately calibrated on the vessels the accuracy of the bearings left room for improvement. This type MHF beacon should be considered for emergency use only, on an operation. The MHF beacon used on the tests required an antenna 270 feet long for proper propagation. A small lightweight HF beacon similar to that used on the tests should be considered for emergency use in the air and after landing on the surface out of range of contact with the recovery vessels. This HF beacon should be compatible with the AN/ARN-6 aircraft homing equipment, have a spike

antenna as necessary in lieu of the long antenna, and be completely self contained and waterproof. This HF beacon is preferable to the heavy unwieldy AN/CRT-3(Gibson Girl).

F-3. What radar reflectors, "window" etc., will insure recovery?

No equipment can insure recovery. Radar reflectors should not be used for tracking the balloon. However, a collapsible type that is carried in the life raft should be used to aid in surface recovery. Portable radar targets on the surface will give better performance than the VHF beacon on the surface, when used with surface radar. However, airborne detection equipment has longer operating ranges.

F-4. Can a sterile CO-2 inflated boat be built to carry the balloonist and his equipment? Should the same type of floatation be attached to the gondola?

A sterile CO-2 inflated boat can be obtained on 1 month notice. Floatation gear should not be attached to gondola. It should be allowed to sink under operational conditions.

F-5. What type of clothing should be worn to keep the agent warm in flight and dry/warm if a water landing is necessary? (Water temperatures as low as 36°F might be encountered).

For cold weather, where water landing is possible, the balloonist should wear the Naval Aviator's Mk 4 Anti-exposure suit (liner, outer garment and boots), gloves or mittens, wool or fur hat including ear protection, and Mae West overall.

For cool weather without extreme low temperatures, he should wear the Army cold bar anti-exposure suit under a layer of outer clothing, boots similar to those in Mk 4 anti-exposure suits, gloves or mittens, head protection, and Mae West.

For warm weather and tropic waters, he should wear normal clothing, boots similar to above, and Mae West.

F-6. What airborne electronic or tracking means can be utilized to track the balloons?

Most military aircraft carry Low-High freq. homing equipment such as the AN/ARN-6 (200-1750 kc). This would be suitable for homing on the HF beacon mentioned in F-2. Airborne VHF homing equipment can be used for tracking the balloon, however, its installation on military aircraft is not nearly as widespread as is the low frequency homer. At least one tracking aircraft (P2V, P5M, etc.) should be provided wherever feasible. There are no secure means of tracking the balloon throughout the flight.

F-7. What surface/water electronic aids will insure recovery?

None will insure recovery. However, an HF beacon (or a Gibson Girl) should be used in emergency if the landing is not made in the proximity of the recovery vessels.

F-8. What underwater commo means could provide a secure channel for location of the balloon by a submarine?

There are some sea areas in which a balloonist could drop grenades which might be heard at long distances by a submarine, and vectored on. This would be reasonably secure. However, at the present time, it must be considered that there is no underwater channel, secure or otherwise, that would give likelihood of locating a balloon or downed balloonist by a submarine or other vessel.

F-9. What new dye markers or underwater long-range signals will be useful?

The dye markers which come with the Mae West and Mk 2 inflatable boat are adequate.

No new underwater long range signals can be counted on, in the present state of development, to be useful. 50X1

F-10. What compact rations might be provided the balloonist for his subsistence after landing in enemy or friendly territory? 50X1

In cold weather areas, balloonist should carry 12 tins of Food Packet, Individual, Survival, Arctic, 2 bars of pemmican and 6 biscuits for use with pemmican. Rations 1 to 6 and 8 to 13 will be 1 tin each, and rations 7 and 14 will consist of 1 bar of pemmican and 3 biscuits. Total-20 lbs 1.

In warm weather, 14 tins of Food Packet, Individual, Survival, tropical pack, should be carried, one for each day.

Care should be taken, in selecting Food Packets, to provide variety instead of all tins being alike ~~in variety~~.

Enclosure (2)

PHASE I TESTS PRELIMINARY TO SUBMARINE LAUNCHING TESTS

A. Introduction

1. This report covers the Phase I tests of the Submarine balloon launching and photographic operational tests. 50X1

2. The tests were conducted using contractor facilities and personnel in the vicinity of Minneapolis, Minn. during the period of 28 March to 8 April 1955. 50X1

3. Agency personnel attending the tests were: [redacted] The party arrived at the plant at approximately 1600 hours on 28 March 1955. [redacted] arrived the evening before and worked at the plant during the day readying the commo equipment. 50X1

B. Abstract

1. Three successful qualification flights were made on the new natural shape 343P balloon. The new design has been approved for further utilization.

2. Modified gondola and camera installations were tested and found suitable for the project.

3. Tests of radio and beacon equipment determined which available radios and beacons would be the most desirable for further test on Phase II and/or operational use.

4. Radar detectability of the system by Air Defense Command supplemented the study made at White Sands in 1952 and provided up-to-date information.

ENC. 2

C. Objectives

1. Flight tests were multipurpose tests planned to encompass the following:

a. Test the new natural shape 343P balloon

b. Determine the suitability of the modified gondolas

c. Test cameras and camera installation

d. Determine the capabilities at altitude of the various radio and beacon equipment.

D. Equipment Description

1. Balloon. Three (3) 16,000 cu. ft. balloons were fabricated according to "Natural Shape" specifications. This balloon is designated the 343P

Enclosure (2)

2. Gondolas. Three (3) standard size gondolas were modified with a twelve inch hole in the base of the canvas, placed on center and sixteen inches in from one end. Two-inch safety webbing was sewed on the support lines above the gondola to facilitate taking pictures with an oblique camera.

The gondola platform was fabricated in two twenty-inch sections, hinged together. It included a six inch diameter hole and fittings to facilitate taking pictures with a vertical camera.

3. Camera Mount. An adjustable camera mount was designed for the K-20 vertical camera. Levels were cemented at 90° angles on the camera to assure verticality.

4. Ground Cloth. A special ground cloth was provided, 8' x 25' with grommets four feet apart around the outer edge. Eight foot lengths of nylon line attached to each grommet.

5. Gondola Hood. A hood was made of three mil polyethylene to fit over the gondola to provide protection against the low temperatures encountered on high altitude flights.

6. Pillow Balloons. Several P200 pillow balloons were provided to support the low frequency beacon and antenna. These pillow balloons were secured to the gondola in flight and were extended to the antenna length (270') prior to landing to insure continuous transmission of the beacon signal after touchdown.

7. Special LF or MHF Beacon. A special four pound 1676Kc beacon was designed and sealed in a waterproof container. This gave a signal for the tracking aircraft to follow as well as the ground tracking vehicles.

8. Peravia Barograph. The Peravia barograph was used to record in-flight data and, in addition, was rigged to record the time interval between pictures.

The above equipment was provided by the contractor. The following items were furnished by the Agency:

9. Cameras. Two unmodified K-20 aerial cameras were used on each flight. The vertical camera had a six and three quarter inch focal length lens and the K-20 used for obliques had a fifteen inch telephoto lens. Super XX aero film was used.

10. Radios.

a. The following transceivers were supplied for test:

HRC-6	HRC-14
HRC-10	HRC-17

Enclosure (2)

11. VHF Beacon. A prototype 124.5 mcs beacon was furnished by TSS/APD.

12. Oxygen Equipment. Two 295 cu. in. portable oxygen breathing systems consisting of the cylinder, regulator and mask were borrowed from NAS, Minneapolis, Minn. for use on these tests.

E. Test Procedure

1. A briefing was conducted for all participating personnel since this was the first opportunity to get everyone together, firm up final plans, and make assignments.

2. Three flight tests were planned to be performed under simulated operational conditions. The first flight was to be flown at a pressure ceiling of 12,000 feet; the second at 15,000 or 16,000 feet; and the third at 18,000 or 20,000 feet dependent on tolerable weight. Each flight was performed with complete regard for personnel safety, using a chase plane and two ground tracking vehicles for recovery. Maximum security and established policy regarding release of information were observed. A forecaster would predict a trajectory from which a particular target area would be selected. The oblique camera would be used to take pictures approaching the target area and when departing the area or in the event the target was missed the oblique camera would assure primary coverage of the target area. The vertical camera mounted in the gondola was for use directly over the target or adjacent areas and one camera would supplement the other in obtaining the objective.

3. The various pieces of radio equipment were to be tested for range, functioning at altitude and directional characteristics. The following call letters were assigned:

NCA50 - Base Station
NCA51 - Balloon
NCA52 - Tracking A/C
NCA53 - Navy Truck
NCA54 - GMI Truck

a. PRC-10 Transceiver, 51 mcs. Primary communication. This unit was used to transmit call letters, position, time and altitude. It was used with a ground plane antenna. The sets were distributed one unit each in: the balloon, the tracking aircraft, the Navy truck and the Base Station.

b. PRC-6 Transceiver, 51 mcs. This set was tested for altitude characteristics. One unit each in the: balloon, aircraft, and GMI Truck.

c. PRC-17 Transceiver. 121.5 and 243.0 mcs. The PRC-17 was a new rescue and emergency type unit for basic test. One unit each was assigned to the balloon, the Navy Truck, and the Base Station.

d. PRC-14 Transceiver. These sets are new development AF items

and are portable four preset channel UHF sets. They were provided for initial and basic testing with one unit in the balloon and one at the Base Station. In addition this set was used for primary communication with the Air Defense Command for the radar detection tests.

e. The Base Station was also equipped with an SP-600 Hammerlund Receiver and an S-36 Hallicrafter Receiver which provided coverage of all bands except UHF.

f. The balloon commo schedule was established to provide initial contact fifteen minutes after launch, at thirty minutes after, then forty minutes, fifty minutes, sixty minutes, with this schedule to continue on a ten minute basis until flight termination or as determined from flight conditions, to a desired distance of one hundred miles.

F. Test Operations

1. Preliminary preparations Flight #1

a. An initial check on the weather indicated that the winds, surface, and sky conditions would be favorable for Tuesday morning, 29 March 1955 with another check required at 2300 hours.

b. The commo representatives had worked all day getting the PRC-6's, 10's and 17's checked out and ready for the flight. The PRC-14 sets had been air shipped and arrived the afternoon of 28 March. It was found that the sets were short the silver cell batteries and a call was made to have the batteries shipped direct from Rome, New York. That evening they worked on the sets trying to get them ready. By 2230 hours it was obvious that without proper batteries, the condition of the sets did not warrant an attempt to use them on this flight. As an alternate it was decided to use the PRC-17 on the guard channel (243.0 mcs.) UHF as the primary commo to ADC. After confirmation of the 2300 hour weather sequence, a telephone call to the ADC alerted them for radar tracking and an 0700 hour launch.

c. During the evening of 28 March the IF and VHF beacons were also checked and readied for flight. In addition, all other equipment was assembled and weighed to establish the load schedule.

2. Conduct of Flight #1

a. At 0400 hours on 29 March the personnel assembled at the contractor's plant, loaded the gear and proceeded to the launch site. The weather conditions for launching were excellent. The winds were very light and variable at all altitudes. Skies were clear and the visibility unlimited. Under the above conditions a trajectory forecast was not predictable and it was decided to select a target after the system was airborne. Rigging and layout were started at 0600 hours. The inflation and launch could have been completed by 0630 hours but were delayed to wait for more light for photography and the 0700 hours committment given to ADC. The weights

and load schedule for a 12,500 foot theoretical pressure ceiling are shown in Figure 1. Loading for the desired altitude permitted the use of a co-pilot to handle all communications. Inflation was accomplished without incident in a few knots of wind. Temperature was close to freezing. Last minute checks on the radios were made and take-off was made at 0700 hours, CST.

b. Figure 2 is a combined flight log recorded during the flight. The Peravia barograph indicated on average rate of rise of 255 feet per minute to a ceiling of 14,000 feet. On reaching 14,000 feet, breathing became noticeably difficult for both pilot and co-pilot so they elected to descend to a more comfortable altitude. Upon reaching approximately 12,000 feet New Richmond, Wisconsin was selected as the target. Because the velocity was slow (about 5 mph) the radio reporting schedule was changed to every half hour. After photographing the target an average rate of descent of 270 feet per minute was established. The flight terminated forty-one miles from the launch site at 1330 hours, CST.

3. Test results of Flight #1

a. This was the first flight test of the 343P balloon and gave evidence of a good design. No ballast was required other than that used to maneuver. The duct appendix extended slightly below the base of the balloon and resulted in slight super pressure at pressure ceiling which was relieved by opening the hand hole. From the pressure ceiling attained, the volume of the balloon was slightly in excess of 16,000 cu. ft. by approximately three per cent. This may be expected since the volume may vary by ± five per cent because of allowable fabrication tolerances.

b. The PRC-10 was used as the primary communication equipment and with a ground plane antenna worked satisfactorily during the entire flight. This set apparently was not affected at this altitude and provided the best communications available on any test flight.

c. The PRC-6 worked satisfactorily using the same ground plane antenna with no breakdown noted at 14,000 feet but naturally did not have as much range as the PRC-10.

d. The PRC-17's were entirely unsatisfactory and except for some intercepted transmissions from AF or Navy fixed equipment received by the unit in the balloon there was no intercommunication whatsoever. Because the PRC-17 was ineffective, a ground plane antenna was fabricated for the balloon unit to give it another trial on the next flight.

e. The VHF beacon functioned but was not identified and received at the Base Station because of lack of a coded identification and the close proximity of another carrier wave. After encountering this receiving difficulty the beacon was modified with an electric drive coding device for identification. In view of the results obtained with the PRC-17, it was considered desirable to provide this beacon with a ground plane antenna.

f. The LF (1676Kc) beacon worked very well and was received continuously by the tracking vehicles and A/C.

g. Cameras. A strip of film was cut from each roll of exposed film and developed with the disconcerting results that both rolls of film were overexposed. Dismantling and inspection of the cameras revealed that both shutters were malfunctioning. The six and three quarter inch lens and shutter assembly had apparently been previously disassembled and damaged. The lens and shutter from another K-20 were substituted and properly assembled. After inspecting the mechanism, it was determined that the fifteen inch modified cameras had the trigger assembly improperly assembled at the factory. Proper assembly of the fifteen inch camera rectified the difficulty.

h. The pilots reported that the lack of oxygen above 12,000 feet definitely hampered their ability to expend any energy. Slight physical movement would increase the heart beat and made breathing difficult.

4. Preliminary Preparations Flight #2

a. Equipment difficulties indicated from Flight #1 precluded a flight on 31 March. Undesirable weather conditions were indicated for 1 April and provided another day for additional work on the equipment. All equipment was ready for the launch on 2 April with only one HRC-14 working properly for the balloon and one other in questionable condition for the Base Station.

5. Conduct of Flight Test #2

a. The second flight was flown on Saturday, 2 April 1955. Figure 3 is the load schedule for a pressure ceiling of 17,000 feet at a gross load of 623 pounds. The weather data indicated a more definite upper wind pattern for this flight. A three-hour duration flight was forecast to impact about twenty miles S. E. of Durand, Wisconsin. The plotted forecast trajectory did not show any suitable targets so a target was later selected in the path of the balloon.

b. Figure 4 is a combined flight log of this flight. Take-off was at 0716 hours CST with the balloon rising to its ceiling of 17,700 feet at an average rate of 270 feet per minute from the barograph. Plum City, Wisconsin was selected as the target, with oblique photos made on approaching and leaving and vertical shots made directly over the city. The landing was made at 1110 hours CST, 110 miles from the launch site.

6. Test Results of Flight #2

a. This flight was routine and uneventful. The balloon exceeded its pressure ceiling by only a few hundred feet after compensating for the ballast used going through a low level inversion and the subsequent gas lost by valving to adjust the rate of rise.

b. The HRC-10 performed satisfactorily. The HRC-14 functioned

very well when working withthe ADC Base Station. The LF (1676Kc) beacon provided a continuous signal for homing and location. The VHF beacon modified with a coded signal provided line of sight reception to a distance of eighty-five to ninety miles.

c. The cameras functioned properly on this flight. The vertical was used with F11 and 125th second. The oblique at f.11 and 250th second. The sample strips indicated that the negatives were thin and would be more acceptable if more dense negatives were made by opening the lens.

d. Again the ADC was unable to paint the balloon system on their radars. Even though three reports were made giving position and altitude that were acknowledged by ADC, the operators were uhable to detect the balloon pip on their radar scope.

7. Preliminary Preparations for Flight #3

a. Adverse weather conditions existed during the period 3 - 6 April. During this period a visit was made to the ADC Control Center to discuss the negative results of the first two flights and provide additional information relating to the third flight so that the radar operators would be better prepared to determine whether or not this balloon system could be received and identified on the radar scopes. ADC provided RR6AU chaff (radar target) packages to be carried and dropped on request for position indicating purposes.

b. In addition to the equipment flown on the earlier flights, a polyethylene hood was fabricated to prevent heat loss from the gondola. Two P-200 pillow balloons were provided to support the LF beacon and antenna after landing.

c. From the 2300 - 6 April weather data, a four hour duration flight trajectory was forecast with flight termination predicated in the vicinity of New Hampton, Iowa.

8. Conduct of Flight Test #3

a. This flight was flown on 7 April 1955. Figure 5 is the load schedule for a pressure ceiling of 20,000 feet at a gross load of 560 pounds. During inflation, a crew member pulled too vigorously on just one side of the reefing sleeve causing it to bind on the tapes on the other side. A platform ladder was moved up and the binding relieved without damage and the inflation completed.

b. Take-off was at 0742 CST. The balloon ascended to 20,000 feet at an average rate of rise of 200 fpm. derived from the barograph. The peak ceiling attained was 20,900 feet indicated with a pressure ceiling or floating level of 20,500 feet. Figure 6 is a combined flight log of this flight. While at altitude, the balloon had a ground speed of 55 mph which made it difficult for the recovery vehicles to stay in position and also necessitated decreasing the time intervals between photographs from 30 and 15 secs to 5 secs in order to have the target in the field of view.

c. The photo target used was Grand Meadow, Minnesota. Oblique photos were taken approaching and departing the target and the roll of film was finished with oblique of LeRoy, Minnesota. Vertical photos were taken of the target with the 6 3/4" K20.

d. Radio communication equipment functioned very well during the entire flight. Communication on the PRC-14 UHF set to the ADC base stations was excellent with two-way contact at 90 miles. Five radar target chaff drops were made for ADC identification and location purposes.

e. When the photography was completed descent was made at an average rate of 275 fpm. Winds at the lower level were considerably lighter and afforded the recovery crew ample time to get under the balloon. An inversion was encountered at 1500 to 2000 feet above the ground that almost stopped the descent. When the balloon penetrated the inversion, the rate of descent increased and it was necessary to dump the emergency ballast and stop the descent to avoid landing prematurely. The flight was terminated at 1133 CST, 4 miles SSW of New Hampton, Iowa, a distance of 149 miles from take-off.

9. Test Results of Flight #3

A. This manned-plastic balloon flight reached the highest altitude of any flown up to this time. The polyethylene gondola hood prevents loss of heat from the gondola. After a short trial on this flight, the hood was reefed and no longer used because heat received from the sun was sufficient to maintain comfort even though the ambient temperature was below 0°F.

b. The cameras functioned properly and gave satisfactory results. The cameras were used with amber (blue minus) filters at settings of f.8 at 125th sec and f.5.6 at 125th sec for the 6 3/4" and 15" K20's respectively.

c. The communication equipment performed satisfactorily on this flight. Two-way communication on the PRC-10, between the balloon and the base station was maintained to a distance of 80 miles. Beyond this, the base station could hear transmissions up to a distance of 115 miles when the signal became too weak to read. Two-way contact was maintained between the balloon and recovery vehicles during the entire flight. Although the PRC-14 was a four-channel UHF set, only the military emergency frequency (243.0 mc) was compatable with the ADC base stations

and was used during the flight. Continuous two-way commo was maintained during the entire flight with at least one of the two participating ADC sites. Good two-way contact was maintained to a distance of 90 miles between the balloon and one ADC base station. The ADC base radio equipment was an AN/GRC-27, 100 watt output which consists of a T-217/GR transmitter and an R278/GR receiver. The oxygen masks borrowed from the Navy did not have microphones installed and it was very inconvenient to lift the oxygen mask whenever necessary to communicate. The oxygen masks to be used on Phase II will be provided with microphones and an auxiliary loudspeaker will be adapted for use.

d. Both the VHF and LF beacons worked satisfactorily during the flight. From the radio log of the base station, both beacons were received loud and clear at 85 miles. At 105 miles, the beacons were fading and at 125 miles, the beacons were no longer received at the base station. The two P200 pillow balloons were adequate to lift the LF beacon and antenna prior to landing, which in the case of a water landing would aid recovery.

e. The balloon was launched within 26 miles of one ADC radar site and during the first fifty minutes of flight to an altitude of 10,000 feet with three position reports, the radar operators were not able to detect the balloon system. At 0831, 1/2 package of radar target chaff was dropped from an altitude of 10,250 feet at a distance of approximately 36 miles from the radar site. At 0840 the radar stations reported that they had the balloon identified and were tracking. Between 0840 and 0904 three position reports were made from the balloon and acknowledged by the radar stations. At 0904 another chaff drop was made from 16,650 feet. At 0910 ADC reported that contact was lost. At 0917 the radar stations were painting chaff that was falling but were unable to detect the balloon system. At 0935 a full pack of chaff was dropped from 20,900 feet. The radar site south of the track established radar contact at 0942 and was able to identify the balloon system. From 0942, until prior to landing, with the aid of numerous voice position reports and two more chaff drops, the flight was reported to have been continuously tracked by a radar site approximately 25 miles from the termination point. This test substantiates previous determinations, in that detection of the balloon system is improbable. In addition to known positions, it is necessary to positively identify the system (radar chaff) to the operators so that they can discern or discriminate this pip from other interference or stray pips that are present on the normal scope presentation. The equipment used by ADC was the 10cm CPS-6B, S band radar and the 23cm FPS-3 L band radar sets.

E. SUMMARY

1. Balloon System

a. Balloon. Balloon performance was excellent on the three tests. On the first flight and to a lesser degree on the second flight, it was observed that the opening of the duct was lower than the base of the balloon which caused slight super-pressure at ceiling. This will require closer manufacturing tolerances and the change has been made in the specifications and drawings. The 60 lb/min, Mark III valve was very convenient and satisfactory but conservative and judicious use of it is necessary to stay out of trouble.

b. Gondola. The modified gondolas, cameras and accessories were adequate for the Phase II tests and/or operational use.

2. Electronic Equipment

a. The PRC-6 transceiver functioned satisfactorily during the tests but has limited range.

b. The PRC-10 transceivers with ground plane antenna provided good, reliable communications and were satisfactory at 20,000 feet. Air to ground communications were maintained to a range of 80 miles.

c. Three PRC-17's used during these tests were unsatisfactory because of the extreme short range characteristics.

d. The PRC-14 UHF transceiver used during the test was good to a range of 90 miles for air to surface communication. Since the AN/PRC-14 is compatable with Naval shipboard (provided crystals are available) and aircraft communication equipment, both from the standpoint of mode of modulation and frequency range, it is considered to be the unit best suited for use. It was observed that these miniturized units are sensitive and require servicing and adjustment prior to use.

e. The performance characteristics of both the VHF and LF beacon with coded signals are considered acceptable for further use.

3. Radar Detection

a. The first two flights were not detected even when position was known.

b. The third flight was detected and tracked only after position reports and radar target chaff was used to identify the system and educate the operators in discerning the small amplitude target return.

c. ADC representatives reported that to make the target readily detectable, its reflecting surface would have to be increased by more than a factor of 2 over that of the third flight.

d. It is concluded that detection of the balloon system by search radar is improbable.

FIGURE 1

Load Schedule for 29 March - Flight #1

Theoretical Pressure Ceiling 12,500 Feet

Balloon 343P (16,000 cu ft)	65.00
Gondola	48.50
Alt. & Therm.	4.00
Swiss per Avia	7.50
Binoculars	4.00
Vertical Camera 6"	16.00
Oblique Camera 15"	17.00
PRC-6	6.75
PRC-17	6.5
PRC-10	20.00
Ground Plane Antenna	.75
Beacon LF	4.75
Beacon VHF	5.5
2-Insulated Bags	4.0
Misc tape, line, etc.	5.00
Ballast	110.00
2 Men and Chutes	395.00
	720.25

FIGURE II

29 MARCH 1955 - COMBINED FLIGHT LOG

0700	Launch
0715	4500' MSL Indicated 1.5 mi N.Circle Pines NCA53 at intersection of 100 and 51 rcvd 5x5 on 10 & 6.NG on 17
0730	8500' 4 mi NE Anoka City Airport NCA53 at Marshall and Snelling 5x5 on 10 & 6. NG on 17
0740	11,000' Ind Temp 27°F, 10,600' true 5mi NE Anoka Airport NCA53 at Mendata Bridge rcvd 5x5 on 10
0750	13,850' Temp 31°F, 12,600' true 6 mi NE Anoka Airport NCA53 Mendata Bridge rcvd 5x5 on 10 next rept 0830
0759	13,900 Indicated
0810	14,000 Indicated Balloon full slightly pressurized with duct slightly below base.
0830	14,000 Indicated Temp 40°F, 12,500' true 6 mi SSE Forest Lake NCA50 rcvd but transmitter bad on PRC-10. NCA53 Hwy 55 and 88, 10 to 10 blocked by ignition noise 10 to 6 5x5, 6 to 6 1x1 weak distance 21 mi to NCA51
0845	14,000' Indicated Pilots noticed anoxia started descent to 12,000'
0900	13,300' Indicated Temp 46°F, 11,500' true 5 mi W Somerset NCA53 at Hwy 218 and 55. 5x5 on both 6 and 10,distance 25mi to NCA51. NCA50 rcvd only.
0930	12,300' Indicated 2mi N Stillwater crs090° approx 2mi/hr NCA50 logged receiving only 5x5 on 10, 3x4 on 6. NCA53 at Jct Hwy 100 and 12, 5x5 on 10, 5x4 on 6, 13mi distant.
1000	11,600' Indicated 2mi WNW Somerset SE surface wind NCA50 rcvd on 10, could not read 6. NCA53 at Hwy 65 and Wis G 5x5 on 10, 3x2 on 6.
1030	12,750' Ind 1mi W Somerset ETA New Richmond 1100-1130 NCA50 rcvd 5x5 from both 10 and 6. NCA53 in New Richmond 5x5 visual contact.
1100	12,750' 1 mi E Somerset,ETA New Richmond 1130. NCA53 in N.R. 5x5 visual contact.
1130	11,600' 2 mi E Somerset, Target New Richmond NCA50 repaired base PRC-10 and established 2-way contact with 51 and 52, 5x5 NCA53 In N.R.5x5 visual contact.

FIGURE II (Cont)

Combined Flight Log

1200	11,250' 2 mi NW New Richmond using cameras NCA5 In two-way contact NCA53 visual contact
1237	Completed photos, started descent in visual contact, and maintained radio contact until landing.
1330	Landed approx. 1 1/2 mi SW of Little Falls, Wisconsin.

FIGURE III

Load Schedule for 2 April 1955 - Flight #2
Theoretical Pressure ceiling 17,000 feet

Balloon 343P	65.00
Gondola	48.50
Altimeter & Therm.	4.00
Peravia	7.50
Binoculars	4.00
Vertical 6" Camera	16.00
Oblique 15" Camera	17.00
PRC-14 w/grd plane	34.00
PRC-10 " "	20.75
PRC-17	6.50
PRC-6	6.75
LF Beacon	4.75
VHF Beacon	7.50
2 Insulated Bags, Misc Tape, Lines etc.	9.00
295 cu in O_2 equip	24.00
Pilot & Parachute	195.75
Ballast	152.00
	623.00

Enclosure (2)

FIGURE IV

2 APRIL 1955 - COMBINED FLIGHT LOG

0716	Take off. Surface Temp 40°F.
0720	Dumped 5 cups (approx 5#) ballast @ 1500 ft.
0723	Alt 2500 feet
0725	Alt 3000 feet
0730	Alt 4500 feet, 3 mi ESE Launch site.
0732	Valved 2 sec (est approx 2#)
0735	Valved 3 sec (est approx 3#) 7,000'
0736	NCA54 rcvd rpt 5 ESE Launch @ 8,000'
0737	Contact NCA50 rpt 5 ESE Launch @ 8,000' 5x5 on PRC-10 maintaining watch on PRC-14-(O-O*
0745	NCA51 Contact with Kidskin 5x5 at 9,000' NCA50 and 53 contact with 51 rpt 6 ESE Ordn plant 9,500' on PRC-10 no reception on PRC-14 or PRC-17. NCA53 on Hwy 100-4 mi S Wite Bear Lake
0750	NCA51 at 10,200' Indicated. Oxy press 1500 psi NCA50 rcvs VHF beacon 5x5
0800	NCA51 @ 12,600' Ind. No radio rpts.
0805	NCA51 over Stillwater at 14,200' NCA54 at bridge and Hudson Wisc. Balloon in sight. Bry .054°
0810	NCA51 @ 15,000' NCA54 - 2 1/2 E of Jct 35 and 12 Hdg N Balloon bry 300° - 5 mi
0815	VHF beacon 5x5 NCA51 rpts 17,300' 1 mi E of Hudson to 53 and 54.
0835	NCA51, 17,650' Ind. 1 mi E River Falls. NCA50 heard 51 make contact with 53 and 54 but could not establish contact.
0845	NCA51 @ 17,600' Ind 3 mi N Ellsworth NCA50 re-established contact on PRC-10
0850	NCA51 contact with 53 and 54 OK for Plum City as target NCA50 rcvd xmit only

Enclosure (2)

FIGURE V (Cont)

Combined Flight Log

0855	VHF Beacon 5x5 seems stronger than previous check
0902	NCA51 @ 17,700' Ind on #72 So ElPaso, Wisc. NCA50 recd but cannot contact 51.
0915	NCA51 over Plum City @ 17,700' Temp / 20°F true, 16,300'-pictures
0916	NCA50 rcvs VHF beacon 5x5
0926	NCA51 @ 17,750', balloon full valved 3 secs - contact with Kidskin to finish roll of film on Durand,Wisc.
0936	NCA50 rcvs VHF beacon 5x5
0945	NCA51 taking pictures NCA50 hears 51,very weak
0950	NCA51 @ 16,200'. Valved 5 secs
0953	NCA51 @ 15,600' Ind.
0958	NCA50 rcvs VHF Beacon 5x5
1000	NCA51 @ 14,900' Ind. Valved 3 secs.
1005	NCA51 @ 13,700' Ind. 12 mi W Independence
1010	NCA51 @ 12,500' Ind.
1025	NCA51 @ 9,000' Ind. NCA50 could no longer rcv VHF Beacon
1035	NCA51 7,000' Ind. Arcadia
1050	Beacons out no reception - 51 @ 2000'
1100	NCA52 (plane) establishes contact starts directing 54
1110	NCA52 rpts 51 down 2 1/4 N of Ettrick Wisc directs 54 into position for recovery
1120	NCA54 arrives at landing for recovery.

FIGURE V

Load Schedule for 7 April 1955 - Flight #3

Theoretical Pressure Ceiling 20,000 feet.

Balloon 343P	65.00
Gondola	48.50
Alt & Therm	4.00
Swiss per Ava	7.50
Binoculars	4.00
Vertical 6" Camera	16.00
Oblique 15" Camera	17.00
PRC-14 w/grd plane	34.00
PRC-10 " "	20.75
LF Beacon	4.75
VHF Beacon "	8.00
295 cu in Oxygen gear	24.00
Passenger & Parachute and misc.	206.50
	460.00
Ballast	100.00
	560.00

FIGURE 6

Combined Flight Log - 7 April 1955

0742 Take off. Surface altitude 860 ft.
0752 Alt. 4160 ft. 330 ft. per min R/C 1 mi SE U of M airport
0800 Contact with 50 on PRC-10 5x5
0811 Alt. 7100 ft. to Kidskin on 14- 5x5 1 mi W highway 100 & 61 no contact with 50
0821 Alt. 8880 ft. 3 pictures on 6" and 15" each of St. Paul downtown
0823 Alt. 9000 ft. to Kidskin 5 x 5 no point over St. Paul airport
0824 50 receiving beacons loud and clear
0825 Repeated 0823 position report on PRC-10 to 50 - 5x5
0830 Alt 10,000 Position report to Kidskin - no paint over Fleming Field
0831 Alt 10,250 dropped 1/2 pkg RR6AU Chaff - 1/2 mi SE Fleming Field
0839 Alt 11,000 contact 53 at Cannon Falls - Received 54 at Ft. Snelling 50 received 5x5 position 4 mi WNW Hastings
0845 Alt. 11,700 3 cup ballast started to use 0_2 (press 1650 psi)
0848 Alt. 12,500 Position to Kidskin 3 mi WSW Hastings heading due South on scope
contact 54 on 10 repeat position 50 read loud but garbled
0852 Alt. 13,700 contact to Kidskin - painting R/C 300 ft per min.
0854 Alt. 14,200 Wind shift noticeable - 1 cup of ballast
0902 Alt. 16,000 50 reads beacons loud and clear
0903 Alt. 16,300 position 2 mi N Cannon Falls contact 54 at C. F. proceeding to Rochester
0904 Alt. 16,650 contact Kidskin dropped chaff - 2 cups ballast
0905 Alt. 17,000 contact to Kidskin - over Cannon Falls - on scope
0909 Alt. 18,300 contact 53
0915 Alt. 20,500 contact 53 west of bend in Highway 52
0916 Alt. 20,800 Position report 4 mi W Haber
0930 Alt. 20,850 contact 50 position 16 mi. N. W. Rochester - on 10 5 x 5
0935 Alt. 20,900 Position report - full pack chaff to Kidskin and Butterfly 11 mi WNW Rochester chaff on Butterfly scope
0941 Alt. 20,850 Position to Kidskin 5x5 on scope of Butterfly 11W Rochester
0942 Alt. 20,850 50 reports beacons loud and clear
0953 Alt. 20,800 chaff to Kidskin & Butterfly
0959 Alt. 20,500 position to 50 on 10 12WSW Rochester
1005 Alt. 20,500 photos on 15" approaching Grand Meadow
photo on 6" at 30 sec and 15 sec interval over Grand Meadow

FIGURE 6 (Cont'd)

1012 Alt. 20,500 51 to 54 position 20WSW of Rochester.
1018 Alt. 20,400 vert. photo at 5 sec intervals
1019 Alt. 20,200 photo on 15" going away from Grand Meadow and approaching Le Roy
1023 Alt. 20,200 crossed East of Le Roy - started descent
1030 Alt. 18,500 50 could hear 51 very, very weak but could not read
1040 Alt. 16,000 50 checked beacons and could not receive either VHF or LF
1045 Alt. 14,700 chaff to butterfly
1133 Landed 4 mi SSW of New Hampton, Iowa.

Enclosure (3)

Phase II - Key West Tests (Submarine Launchings)

ENC. 3

Enclosure (3)

Declassified in Part - Sanitized Copy Approved for Release 2013/07/30 : CIA-RDP78-03639A001200020001-9

Enclosure (3)(a)

A. Resume of each flight

First Flight, 26 April 1955

PURPOSE: (Flight Chart Appended)

To develop techniques of layout of equipment, inflation, takeoff, tracking and recovery at sea, and using miminum gondola equipment in order to test effectiveness of sea and shore based radars against balloon in stripped-down condition.

Weight Schedule for 12000', 745#

1 - 302 P balloon	65.00
1 - Gondola	18.50
Instr.Box (Clock,Variometer,Altimeter)	4.00
PRC-14 (lost)	34.00
VHF Beacon,Bag & Ant. (lost)	7.00
LF Beacon, Bag & Ant.	5.00
ECM Equip.(lost) and recorder	3.00
Food Packet	1.00
Gibson Girl	37.00
Life Raft Mk 2	47.00
Bolex Camera	1.00
Film Recovery Can	3.00
Recovery Drum (lost)	9.00
Pilot & Gear (Compass,Coldbar Suit, Mk 4 anti-exposure boots)	165.00
	429.50
Ballast	315.00
	744.50
Added at launch-Tape Recorder (lost)	3.00
ECM Recorder (lost)	3.00
	750.50

@ 751 calculated altitude 11,800 ft.

Enclosure (3)(a)

Planned Flight Altitude and Duration: 12,000', about 2-1/4 hours.

Tracking Aircraft - 2 AD's with ARN/6, D/F equip. and ARC/27 UHF, one containing photographer to record touchdown.

Tracking and Recovery Vessels

PC 579 on which had been installed 1 PRD-1 and 1 URD 2-A radio direction finder. Photographer.

Albatross (FAMS-1). 1 PRD-1, 1 URD 2-A, photographer.

1 Submarine (Sennett, fleet snorkle type, with SV-1 radar).

1 AVR with photographer.

1 Blimp.

Control and Tracking Vessel (Berthed at Key West) USS Bushnell (AS-15) equipped with 1 PRD-1, 1 URD-2A and excellent air search radar SPS-6. Meterologist and balloon expert on board.

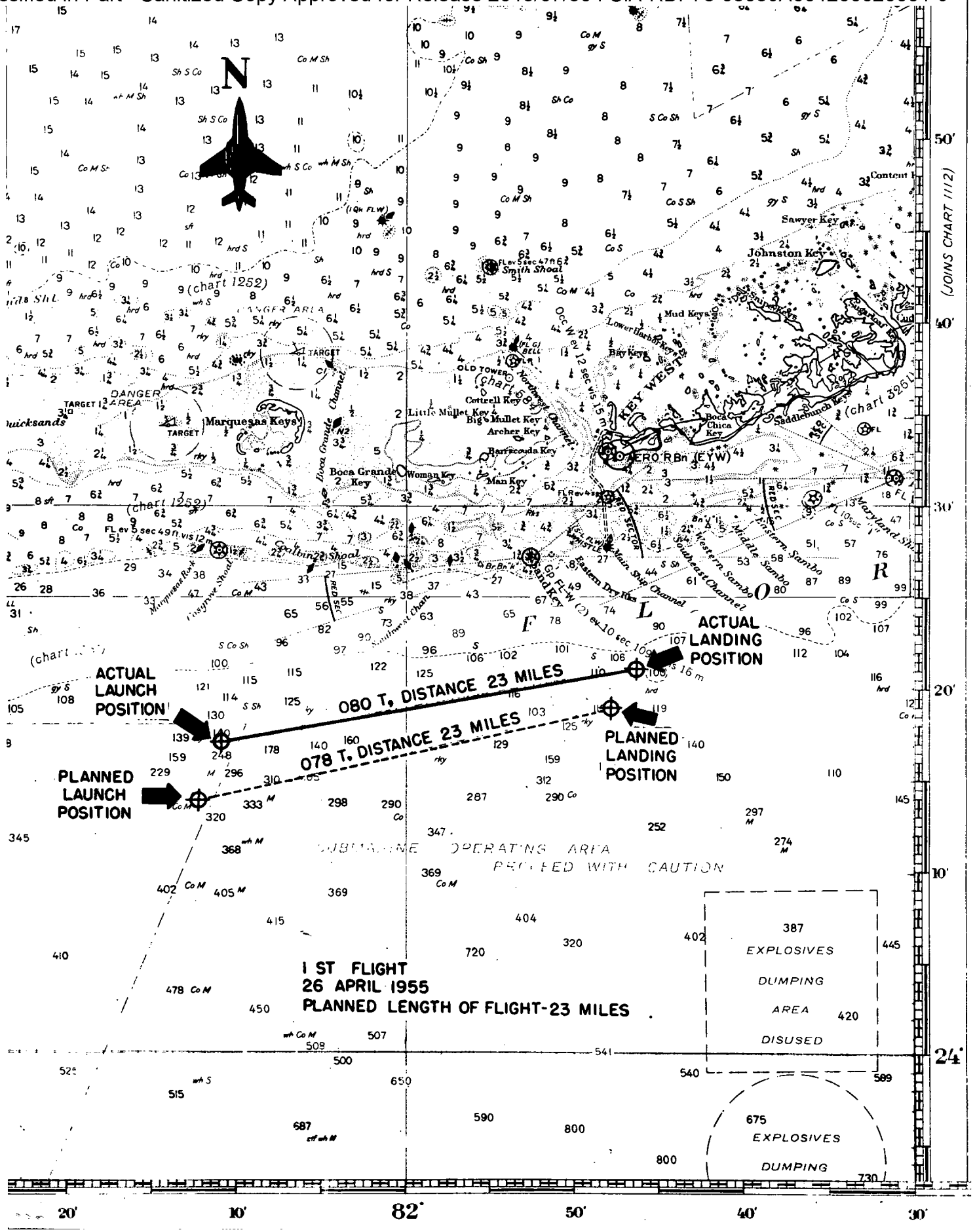
Tracking Shore Station Naval Air Station, Key West - using VHF radio direction finder and GCI radar tracking equipment.

Other Search and Rescue Facilities - Helicopters, seaplanes and AVR's at NAS, Key West, available for emergency use.

Operations - Submarine (Sennett, SS408) underway 1800 25 April. Took pibal sounding, using theodolite, surface to 12000' before dark. Using reports of weather and air soundings from Fleet Weather Central, Miami and NAS, Key West, Bushnell radioed preliminary estimate of launch position (24-18N, 82-12W) and touchdown (24-18N, 81-49W).

Submarine launching personnel made final decision of launching position, using all weather available (Sennett Pibal at 1900, NAS, Key West rawinsonde at 2200 and at 0230 26 April, F.W.C. Miami earlier forecast for 0600, 26 April, and Sennett 0557 pibal to 13000'. Decided to launch at Lat. 24-14N, Long 82-12W (4 mi.south of Bushnell estimate) and drew up a flight plan to touch down at Lat. 24-19N, Long 81-47W, for average course 078°, distance 23 miles. At 0704 opened forward hatch and commenced layout of equipment. 0734 commenced inflation, speed 7 knots with zero wind over deck and completed inflation at 0808. With submarine 3 miles out of position at Lat. 24-17N, Long 82-11W, launched balloon at 0817. Flight altitude 11750'. Touchdown at 1025 in Lat. 24-21N, Long 81-46W. Balloon's average course was actually 080°, distance 23 miles. Track was 2 mi. north of intended track, which was due to launching position being 2 miles too far north. Balloonist inflated boat while in water and climbed into it. AVR made recovery, with submarine, PC, and Albatross within 200 yards and Blimp and 2 AD's circling.

Results: Accomplished the purpose except for loss of some equipment due to failure of closure on watertight container. Actual track was practically identical to intended track.



Second Flight, 28 April 1955
(Flight Chart and K-20 Air Photos Appended)

Purpose:

To develop techniques using oxygen, medium altitude, complete photographic and survival equipment, to determine ability to overfly and photograph at flight altitude a specific target 40 miles from launching point, and preserve equipment in a water landing.

Weight Schedule for 18000', 605#

302 P Balloon	65.00
Gondola	48.00
Variometer	1.00
Altimeter	2.00
PRC-14	34.00
VHF Beacon, Bag & Ant.	7.00
LF Beacon, Bag & Ant.	5.00
Gibson Girl (wet)	45.00
Life Raft	45.00
Parachute	48.00
K 20-6" Camera	21.00
K 20-15" Camera	22.00
Film Recovery Can	3.00
2 Recovery Drums	18.00
Pilot & Gear	165.00
02 equip	28.00
	467.00
Ballast	140.00
	607.00 lbs.
Launched heavy ballast	50.00
	657.00 actual gross weight

@ 65?# pressure altitude calculated at 15,700 ft.

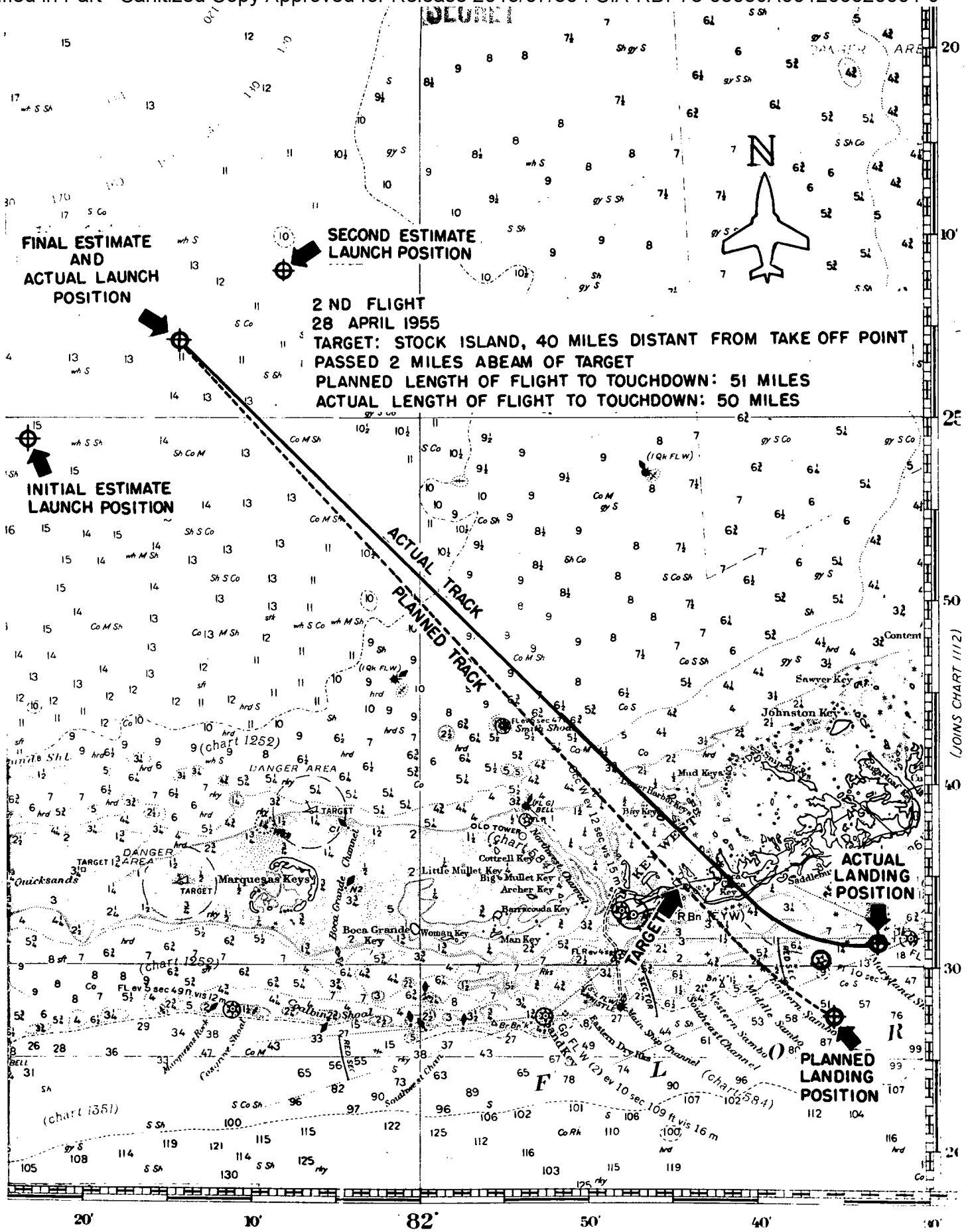
SECRET

Planned Flight Altitude and Duration: 18,000', 3.4 hours.

Tracking, Recovery, Control and Search and Rescue Facilities - Same as for first flight except blimp had photographer aboard.

Operations - Prior to departure from Base, Stock Island was selected as target because midway between Key West and Naval Air Station with excellent photographic targets 2-3 miles abeam. Initial estimate of launching position was 24-59N, 82-23W. Submarine (Sennett) underway 1900, 27 April. Took night pibal readings using theodolite and/or radar at 2000, 0230 (28 April) and 0445; two highest were 13000' and 14000'. On basis of new weather data, launching personnel directed submarine to proceed to a new launching position 6 miles further northeast, at 0148 received warning from Bushnell that launching position could shift 10-15 miles ENE and that next submarine pibal would be important. At 0345 received Bushnell recommended launching position Lat. 25-08N, Long 82-08W. However, at 0532 Submarine radioed its intention to launch from Lat 25-04N, Long 82-14W, with total flight time 3.4 hours. (At 0549 Bushnell radioed it concurred). 0545 opened forward hatch and began layout. Sunrise at 0557. At 0559 were ready to inflate but decided to wait in view 0700 launching time. With zero relative wind, speed 6 knots, began inflation at 0631, stopped at 0645, recommenced at 0655, stopped at 0705, began 0708, completed 0714. (shifted to new bottles twice on low pressure). 0722 launched balloon in Lat. 25-03N, Long 82-16W. Photographic target 40 miles distant. Due to 50 lbs. too much ballast aboard, discovered shortly after launching, balloon leveled off at 15000'. However, winds from 14000' to 18000' were identical and balloonist knew this in staying at 15000'. Balloon closely followed predicted trajectory, crossed over NAS Boca Chica, took photographs, and began descent. It made an excellent water landing at 1122 in Lat. 24-32N, Long 81-32W. AVR made recovery with PC, Albatross, Blimp and 2 AD's standing by.

Results - Accomplished the purpose. Balloon followed planned track, passed 2 miles from target, secured desired photos, and recovered all equipment.



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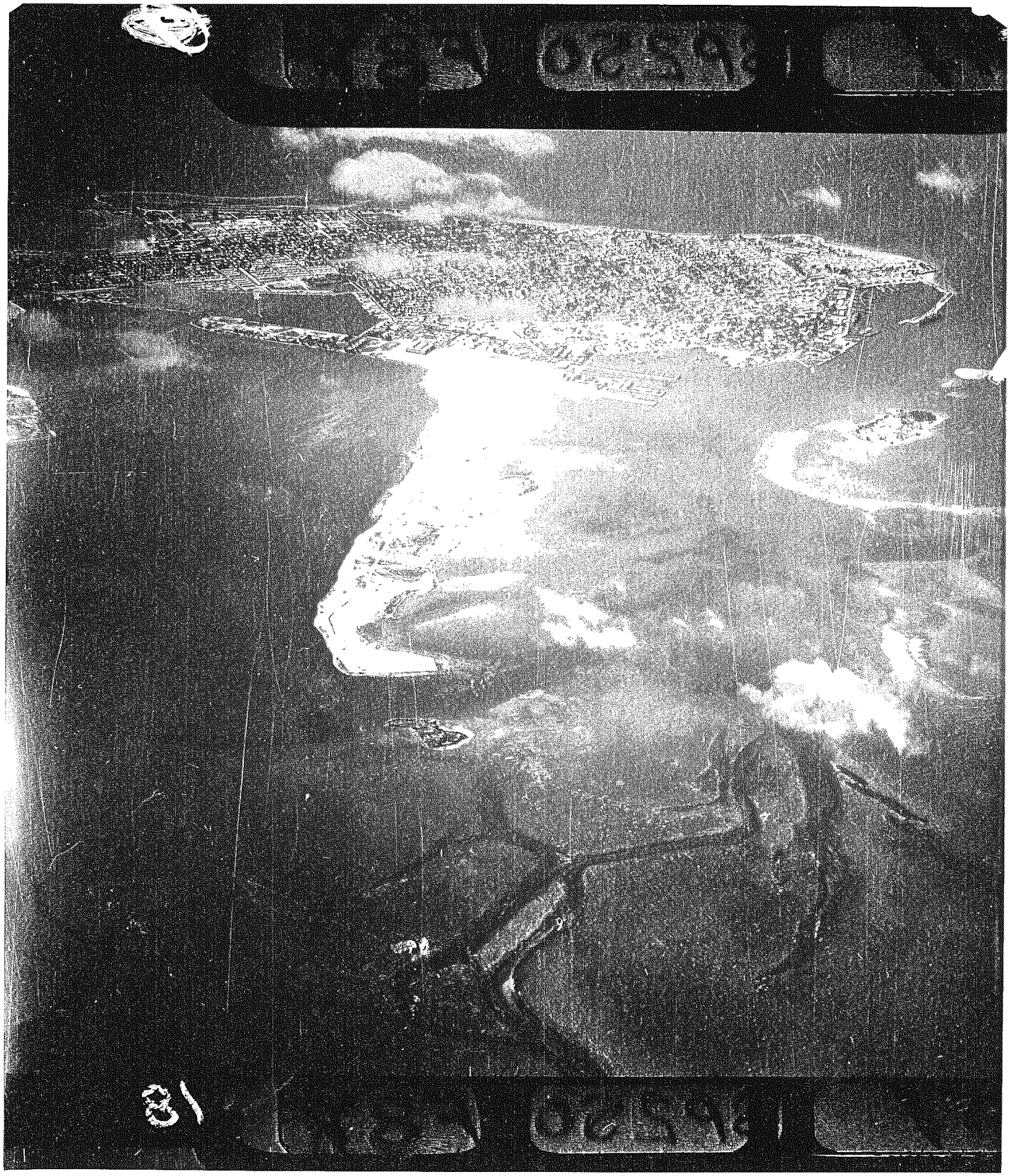

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Keywest - 15000' - oblique - 15" lens

SECRET

SECRET

Key West - 15000' - oblique - 15" lens

SECRET

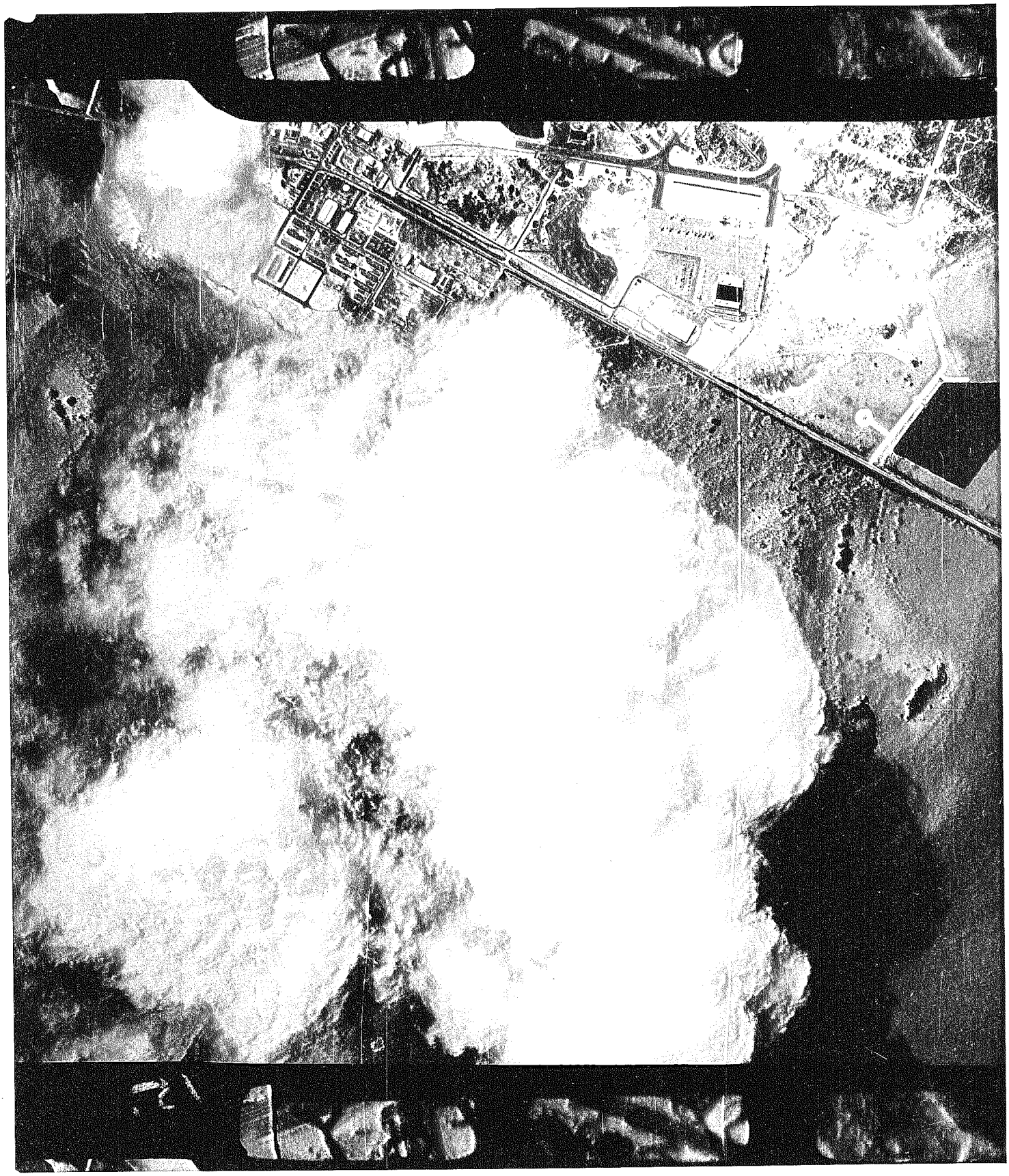
SECRET NAS Key West – 15000' – oblique – 15" lens

SECRET

SECRET

NAS Key West - 15000' - vertical - 6 3/4" cms

SECRET



SECRET

NAS Key West - 15000' - vertical - 6 3/4" lens

SECRET

NAS Key West - 15000' - vertical - 6 3/4" lens

SECRET

SECRET

SECRET

NAS Key West - 15000' - vertical - 6 3/4" Pan

Enclosure (3)(a)

Third Flight, 29 April 1955
(Flight Chart and K-20 Air Photos Appended)

Purpose - Similar to Second Flight except:

(1) Selected a photographic target 60 miles from launching point.

(2) Submarine was initially at periscope depth.

(3) Balloon layout and first half of inflation was in darkness.

(4) Submarine dived after launching.

(5) Planned to level off at high altitude.

Weight Schedule for 20000', 560#

302 P	65.00
Gondola	48.00
Variometer	1.00
Altimeter (lost)	2.00
PRC-14	34.00
VHF Beacon, Bag & Ant.	7.00
IF Beacon, Bag & Ant.(lost-kicked loose on landing)	5.00
Life Raft	45.00
Parachute	48.00
K 20-6"	21.00
K 20-15"	22.00
Film Recovery Can	3.00
2 Recovery Drums	18.00
O_2 Equipment (cylinder lost)	28.00
Pilot & Equipment	165.00
	442.00
Ballast	118.00
	560.00 gross weight

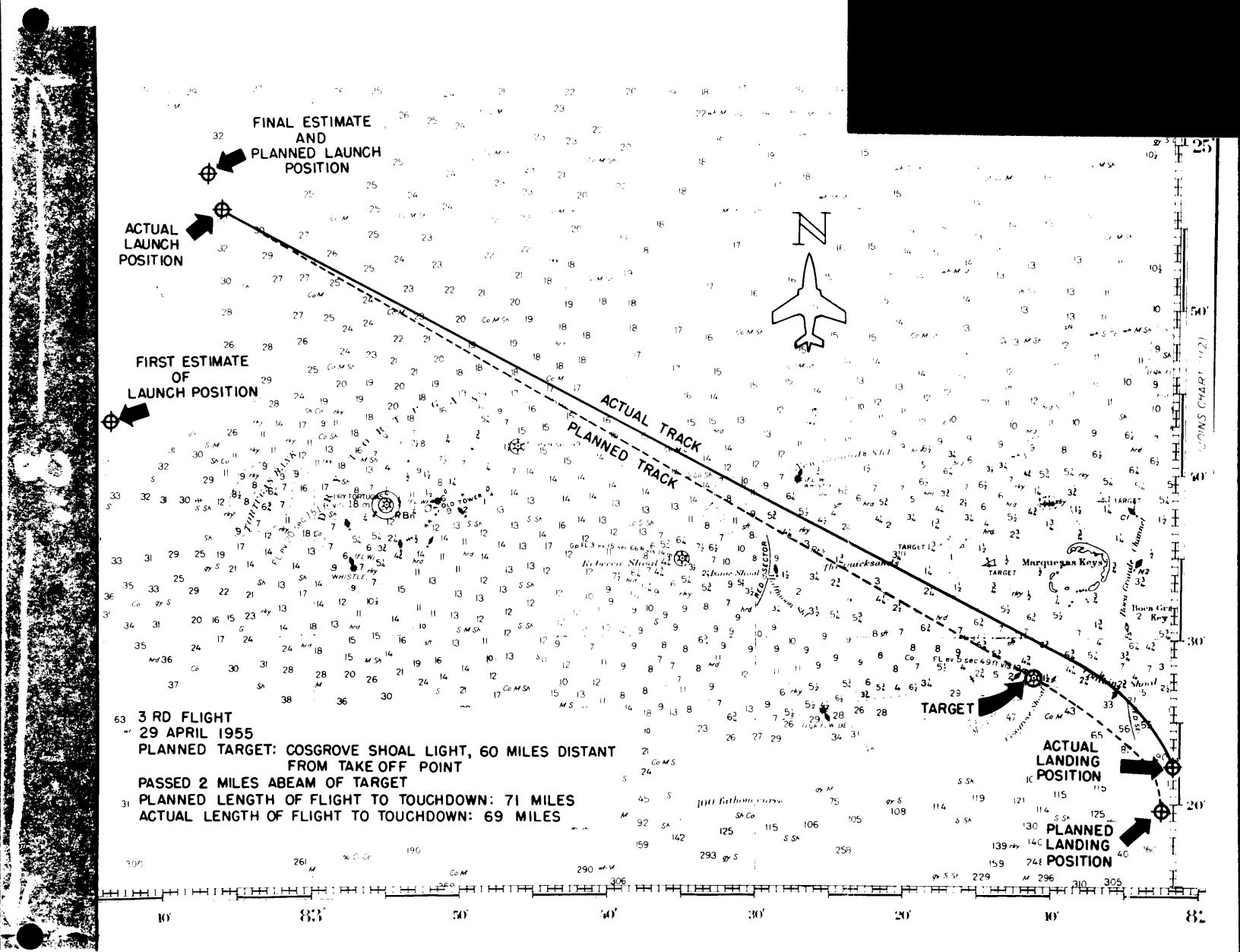
Enclosure (3)(a)

Planned Flight Altitude and Duration - 20,000', 3.7 hours.

Tracking, Recovery, Control and Search and Rescue Facilities - Same as for first flight except an additional AVR type retriever was included, into which the officer conducting the exercise embarked from Bushnell during the balloon flight.

Operations - Prior to departing from Base, Cosgrove Shoal Light, situated at the south end of a large shoal area, was selected as target and an initial general launching area was designated. Launching was planned for 0530, half an hour before sunrise. Submarine (Sennett) underway 1830, 28 April. Due to distance of area, time for only one pibal was allowed. Upper wind direction, as in second flight (28 April), was somewhat uncertain. At 0135, radar and theodolite pibals were sent up by submarine with readings only to 13,000', although radar readings were worked out to 20,000' after launching. At 0134, Bushnell sent a preliminary launch position Lat.24-43N, Long 83-14W. However, launching personnel had made a different wind estimate giving a launching position 17 miles northeast, and submarine was enroute there. This was later changed 2 miles further northeast, and submarine announced it would launch from 24-58N, 83-07W, with primary flight altitude 20,000' and secondary altitude 18,000'. At 0345 submarine dived, and surfaced at 0400. Opened forward hatch at 0403, began layout on deck at 11 knots to gain position, and completed layout at 0425. In view of safety requirements that planes would rendezvous at 0515 after daylight, waited until 0452 to begin inflation, speed 5 knots, zero relative wind. Completed inflation at 0510, daylight beginning to break. Received word aircraft were delayed. 0559 sunrise. 0610 planes in sight so, at 0613, launched balloon in Lat.24-56N, Long 83-06W, 3 miles SE of planned position but only 1 mile off planned track. Submarine dived at 0615. Balloon leveled off at 18,000', picked up speed to about 40 knots, was directed by Bushnell to descend to 15,000' 12 miles before reaching target, passed within 2 miles of Cosgrove Shoal Light at 0810, began descent and touched down on water at 0858 in Lat. 24-25N, Long 82-02W. AVR had balloonist and equipment on board at 0902, with blimp, planes, Albatross and a second AVR standing by. (Lost parachute, oxygen bottle, LF beacon and altimeter.)

Results - Accomplished the purpose. Balloon followed planned track very closely, passed within 2 miles of target, and recovered bulk of equipment.



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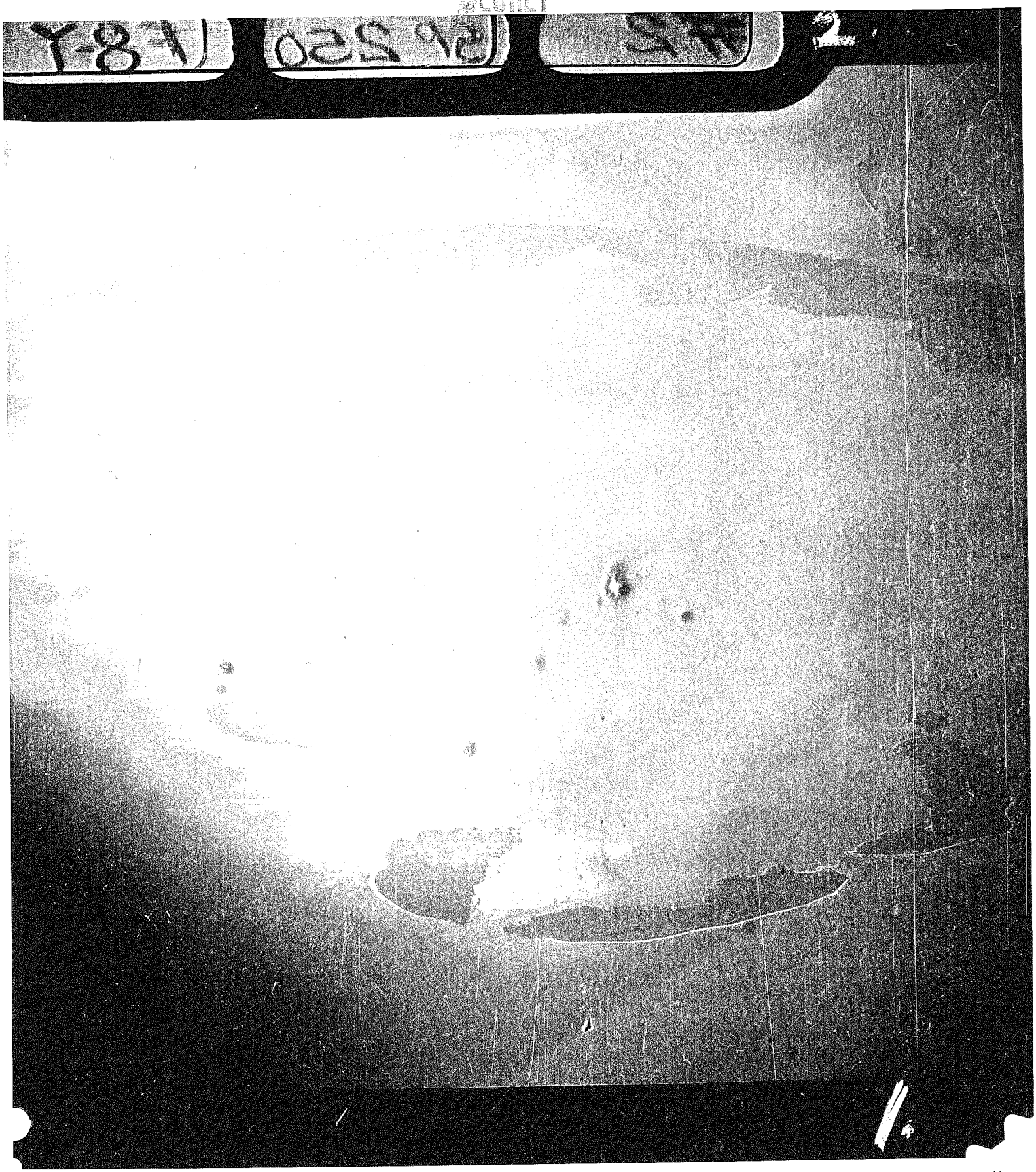


SECRET Marquesas 20.-15000'- oblique -15" bus

Enclosure (3)

(b) Administrative and Operational Arrangements

This project was set up, in the initial step, between the Agency and the Chief of Naval Research. Visits were then made to New London, Conn. and Key West, Florida to discuss feasibility and other problems with the Chief of Staff, Submarine Force Atlantic Fleet, the officer in charge of Fleet Weather Central, Miami, the Commander Naval Base, Key West, and the submarine, surface vessel and aviation commanders in the Key West area. The next step was to discuss the proposed tests with Navy Pentagon officials - the Director of Undersea Warfare and Director of Naval Intelligence. At that point it was decided to approach the tests from the research - feasibility angle and not from the intelligence standpoint. Then a high level approach was made between an Agency representative and the Chief of Naval Operations, the latter giving his approval to the tests in the Key West area. A further conference with the Navy in the Pentagon resulted in a secret radio message from the Chief of Naval Operations to Commander in Chief, Atlantic Fleet, information to interested commands, to conduct the tests in late April 1955. Additional surface vessels were assigned by later radio as tracking and recovery craft. These radios were handled on a limited distribution basis. Copies are attached hereto. Thereafter, direct liaison was maintained between the Agency, ONR, New London, Key West and Miami. A TWX line was established between FWC Miami and the USS Bushnell at Key West, to facilitate passing general weather information and forecasts at least three times a day to the Bushnell, which was headquarters of the Commander Submarine Squadron Twelve, who was charged with carrying out the project. Arrangements were also made to pass upper air information from Key West Naval Air Station to the Bushnell four times daily. A public information release was prepared by the Chief of Naval Research in coordination with Agency personnel, to be used at Key West and in Washington if questions were asked. A copy is appended. Navy Operation orders are also attached.

Attachments

1. CNO dispatch 162003Z of 2/16/55.
2. CincLantFlt 172016Z of 2/16/55.
3. CNO dispatch 071449Z of 3/7/55.
4. CNO letter Ser. 0062P37 of 2/24/55.
5. CNR letter Ser. 0563 of 4/8/55.
6. Operation Order No. 15-55, 3/15/55.
7. Ch. #1 to Op. Order - Ser. 001 of 4/25/55.

SECRET

NAVY DEPARTMENT

FROM: CNO

FOR ACTION: CINCLANTFLT

RELEASED BY: W. G. SCHINDLER

INFORMATION: COMSUBLANT
COMOPDEVFOR
AIRDEVRON ONE
COMNAVBASE KWEST
ONR
FLEWEACEN MIAMI

DATE TYPED: 16 FEB 1955

DATE TIME GROUP - 162003Z

PROJ FL/A106/ZZ QUOTE ASST ONR IN TECHNICAL TESTS OF SUB LAUNCHED PLASTIC BLN SYS UNQUOTE HEREBY ASG WITH PRIORITY ABLE ABLE X SVCS AS FOL CLN BY COMSUBLANT ONE SNORKEL SUB FOR PD OF APRX TEN DAYS IN KWEST AREA COMMENCING ABOUT 18 APR 1955 X BY COMOPDEVFOR ONE P2V TRACKING AIRCRAFT AND ONE HCPTR AND ONE AVR TYPE FOR STANDBY RESCUE MSN DURING SAME PD X TESTS CONDUCTED AS DIR BY ONR REP X DIR LIAISON AUTH BTWN PARTICIPATING COMDS AND AGENCIES X SUB SVCS HEREIN ASG NOT CHGD AGAINST SIX R&D SUBS ON THE LINE X PROJ DETAILS FOL BY LTR

ORIG... 03(37)

COPY TO... 31... 53... ONR

37
373
31
311
533

Enclosure (3) (b)
Attachment 1

SECRET

SECRET

M 172016Z

FM CLINCLANTFLT

TO COMSUBLANT

COMOPDEVFOR

INFO AIRDEVRON ONE

COMNAVB KWEST

ONR

FLEWEACEN MIAMI

CNO 162003Z X PROJ FL/A106 HEREBY ASSIGNED COMSUBLANT OR DESIG REI FOR PROSECUTION X OPDEVFOR PROVIDE SVCS AS ASG X DIRL AUTH

CFN 162003Z FL/A106

Enclosure (3) (b)
Attachment 2

SECRET

NAVY DEPARTMENT

FROM: CNO

FOR ACTION: COMOPDEVFOR

RELEASED BY: GG CRISSMAN CAPT USN

INFORMATION: CINCLANTFLT
COMSUBLANT
AIRDEVRON ONE
COMNABASE KWEST
FLEWEACEN MIAMI
ONR

DATE TYPED: 7 MAR 1955

DATE TIME GROUP - 071449Z

MY 162003Z FEB MODIFIED TO ADD SVCS PCE-579 AND USS ALBATROSS

EAMS-1 AS REQUESTED BY ONR REP FOR DURATION PROJECTED TESTS

ORIG 03(37)

COPY TO...31...53....ONR

37
373
31
311

Enclosure (3) (b)
Attachment 3

SECRET

SECRET

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
Washington 25, D. C.

Op-373/jr
Ser 0062P37

AIR MAIL

24 Feb 1955

From: Chief of Naval Operations
To: Commander in Chief, U. S. Atlantic Fleet

Subj: Project FL/A106/ZZ, "Assist the Office of Naval Research in technical tests of submarine launched plastic balloon system"

Ref: (a) CNO sec msg 162ØØ3Z of Feb 1955
(b) ONR sec ltr ser 00199 of 10 Feb 1955

Encl: (1) Project Details

1. The subject project was assigned by referenced (a).

2. The contents of reference (b) are included in enclosure (1) as project details.

W. G. SCHINDLER
By direction

Copy to: (w/encl)
ADDEE (9)
COMOPDEVFOR
COMSUBLANT
SADD
CO VX-1
FLEWEACEN, Miami
ONR (5)
Op-03C
Op-31
Op-311
Op-33
Op-533

Authenticated by:

H. L. Thompson, Jr.
Captain, U. S. N.

Enclosure (3) (b)
Attachment 4

Project FL/A106/ZZ Priority "AA"

PROJECT DETAILS

PURPOSE

1. The purpose of this project is to assist the Office of Naval Research in determining the feasibility of launching a plastic balloon system from a fleet-type submarine and to evaluate the technique of accomplishing same. It is further desired to evalute the practicability of integrating a manned balloon system with submarines for possible usage in military applications.

SCOPE OF TESTS

1. Launchings of three separate piloted plastic balloons are desired from a submarine in an area north of Key West, Florida, to be selected with respect to appropriate upper winds. Each balloon is to be launched from the deck of a submarine, ascend to an altitude of approximately 20,000 feet, float toward the Florida mainland, then descend and land in a general area to be selected.

2. The following specific services are required from fleet activities:

a. Submarine Services

(1) A guppy or fleet snorkel submarine will be required to take aboard approximately 60 standard helium cylinders for each flight. Temporary minor modifications will be required to accomplish this, because all cylinders should be stowed as close together as possible. It is believed feasible to accomplish this by moving two or three bunks in the forward torpedo room, rearranging the torpedoes, shoring a small section of the deck with two-by-fours to distribute the load, and installing the cylinders vertically.

(2) Auxiliary equipment which must be stowed aboard, will include helium manifolding gear, balloon, canvas gondola, and pilot's flight equipment which will include a small radio transmitter and receiver, automatic radio beacon, rubber life raft, oxygen supply, parachute, photographic equipment, etc.

(3) The submarine will be required to proceed to an area adjacent to Key West, selected on the basis of current winds between the surface and 20,000 feet.

(4) For a period of approximately one hour, which will include preparation of the flight, inflation, and launch, the submarine will be required to remain on the surface and maneuver down wind to maintain a

minimum relative surface wind.

(5) Launchings will be supervised and conducted by representatives of the Office of Naval Research. The assistance of one or two competent submarine enlisted personnel may be required for operating the helium manifold and similar duties.

(6) Communication facilities will be required prior to launching for receipt of the most recent current weather data and weather forecasts, and to establish communications with tracking aircraft.

(7) Submarine communication facilities will be required after the flight is launched in order to monitor the test as it progresses, keep informed of any problems which may arise, and to issue instructions to the pilot and tracking aircraft if a need arises.

(8) Since each launch should be conducted on separate days, the discharged helium cylinders must be replaced at the base facility (Key West) with full cylinders prior to the next tests.

b. Fleet Weather Central

(1) Fleet Weather Central assistance will be required to provide forecasts for the launch and impact areas, plus reports of observations and forecasts of winds at the surface, 2,000 feet, 5,000 feet, 10,000 feet, 15,000 feet and 20,000 feet.

(2) Final forecasts embodying revisions and current pertinent data should be provided by the Fleet Weather Central immediately prior to commencing a balloon layout and inflation.

(3) Continuing advisories should be issued while the flight is in progress if there are changes in upper winds and/or different conditions existing at the impact area.

c. Tracking and Recovery

(1) A tracking aircraft will be required to rendezvous with the submarine at the approximate time inflation commences. After the balloon is launched, the tracking aircraft (P2V or comparable type) will be required to track the flight visually, with ADF, and by radar, if feasible. The plane will also be required to establish communications with the pilot, and function as a relay station for transmitting messages between the pilot and submarine if required. The aircraft will be required to track the flight until termination and vector in a helicopter for pilot pickup if required.

(2) A helicopter should be available on a stand-by basis for possible use in picking the pilot up from water or land.

DESCRIPTION OF EQUIPMENT

1. In general, the sytem includes a 30-foot plastic balloon made of polyethylene material and has a collapsible canvas gondola for the pilot. No installation costs are involved except for incidental costs for the minor stowage requirement noted above. The balloon system has been tested in launchings principally in flights originating in areas of Minneapolis, Minnesota, and White Sands, New Mexico. Flights have also been launched successfully from surface ships.

STATUS OF EQUIPMENT

1. The system to be tested will be available by 1 April. Helium cylinders can be made available at the designated base at that time.

2. Funds required for the helium bottle installation will be made available for transfer to the appropriate fleet command.

REMARKS

1. It is desired that the tests be carried out during the latter half of April, and be completed by 1 May 1955, if practicable.

2. It is estimated a period of 10 operating days should be set aside for completion of the tests. The three launchings will be carried out as expeditiously as possible although weather conditions might prolong the tests for the full 10-day period.

3. Approximately five to seven representatives of the Office of Naval Research will be available at the designated base. A minimum of five will be provided for conducting the tests afloat.

4. Liaison for this project will be:

LCDR Malcolm D. Ross, ONR, (Code 461), Balloon Projects Officer, Telephone: Liberty 5-6700, Ext. 62891

CAPT. K. G. Hensel, USN, Projects Officer, ONR (Code 100), Telephone: Liberty 5-6700, Ext. 66177.

SECRET

ONR:109:dr
Ser 0563
8 April 1955

From: Chief of Naval Research
To: Commander, U. S. Naval Base, Key West, Florida

Subj: Project FL/A/106, information release on

Encl: (1) Proposed release

1. Attachment 5A has been prepared for release in the event that inquiries resulting from observation of this project are received. Interested parties have reviewed and approved contents of this release, the substance of which is considered suitable for any necessary briefing of personnel involved. Due to the nature of this project, it is essential that no information which is not provided in Attachment 5A be released.

2. In the event of unforeseen incidents which might result in further inquiries from the press or other media and which cannot be answered from the material in Attachment 5A, all inquiries should be referred to the Office of Naval Research, LCDR, P. G. Conwell, USN, Liberty 5-6700, extension 64690.

3. By copy of this letter, the Office of the Chief of Naval Operations (Op-37) is requested to advise the Office of Information, Navy Department, and the Office of Public Information, Department of Defense, that any inquries concerning balloon sightings in the Florida area during the period from 25 April to 8 May be referred directly to LCDR Conwell in the Office of Naval Research.

F. R. FURTH

Copy to:
CAPT W. R. Laughon, USN (w/Attachment 5A)
Commander Submarine Squadron Twelve
U. S. Naval Base, Key West, Florida

Op-37, (Attn: CAPT H. L. Thompson, USN) (w/Attachment 5A)
100 (Capt. Hensel)
461
109

SECRET

Enclosure (3) (b)

SECRET

ONR:109:dr
Ser 0563
8 April 1955

For the past several years the Navy has been flying "SKYHOOK" balloons in connection with cosmic ray and meteorological research. These flights have taken place in many latitudes from the tropics to the arctic regions. Valuable information on weather, the atmosphere, and cosmic rays have been gathered through the use of the balloon flight technique. Launchings have taken place both from ships and ground sites.

Several "SKYHOOK" balloons are being flown in this area in connection with a classified project of the Office of Naval Research.

Local flights are being made as part of a meteorological research and instrumentation evaluation project which cannot be accomplished so well by other means. No information about the instruments, including pictures, may be released. All information about the flights and the project is classified and is not for release.

Enclosure (3) (b)
Attachment 5A

SECRET

A4-3

Submarine Refitting & Training Group, Key West
U.S. Naval Base,
Key West, Florida
15 March 1955

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

Task Organization

a. Launching Unit

USS SENNET (SS 408)	1 SS

b. Tracking Unit

NAS Boca Chica	DF Unit
USS BUSHNELL (AS15)	1 AS
USS SENNET (SS408)	1 SS
USS PC 579	1 PC
USS ALBATROSS (EAMS-1)	EAMS-1
Aircraft from VX-1	3 AD and 1 P5M

c. Recovery Unit

USS SENNET (SS408)	1 SS
USS PC 579	1 PC
USS ALBATROSS (EAMS-1)	EAMS-1
AVR from NOU	1 AVR
Normal Search and Rescue Units	Search aircraft
	Helicopter Coast Guard Units
Airship from ZX-11 (if requested)	XL as assigned
Aircraft from VX-1 (if requested)	1 P5M
Fueling seaplane (if requested)	1 P5M

d. Weather Unit

USS SENNET (SS408)	1 SS
Aerology, NAS Boca Chica	
U.S. Fleet Weather Central, Miami	

1. The Chief of Naval Operations has directed the conduct of Project FL/A106/ZZ - assist ONR in the conduct of project Submarine Plastic balloon system. CINCLANTFLT has assigned this project to COMSUBLANT, who in turn has assigned it to COMSUBREFIT&TRAGRU Key West. Priority AA has been given this project. OPDEVFOR activities in the Key West area have been directed to furnish the necessary services for conduct of this project. Direct liasion has been authorized.

2. Units assigned will carry out operations and record data as specified in Annexes to this OpOrd in order to complete this project during the period 25 April - 8 May 1955.

A-4 3/job
SECRET

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

3. a. Launching Unit

(1) Load and install necessary equipment during the two week period, 11 April to 25 April.

(2) Be prepared to get underway on 25 April and proceed to assigned area.

(3) Carry out operations in accordance with Annex B to this plan.

b. Tracking Unit

(1) Activate at 0900 25 April for testing communications.

(2) Activate at times to be designated by COMSUBREFIT&TRAGRU Key West during conduct of this project.

(3) Track the plastic balloon to be released by SENNET by all means available.

(4) PC 579 and ALBATROSS be prepared to get underway on 25 April and proceed to assigned station.

(5) Aircraft units will be notified at least two (2) hours in advance of take-off time required.

(6) VHF and LF direction finders will be installed on BUSHNELL PC 579 and ALBATROSS.

(7) BUSHNELL will remain at Naval Base, Key West.

c. Recovery Unit

(1) High speed AVR will be underway for recovery point or on 10 minute standby in port during flight operations, as directed by COMSUBREFIT&TRAGRU Key West.

(2) Search and Rescue operations will be requested if the need arises.

(3) In addition to normal Search and Rescue units, ZX-11, HS-1 and VX-1 will provide additional search units if requested.

(4) One P5M is scheduled to be operating locally with GUAVINA and is available for emergency assistance.

(5) All recovery units be equipped for recovery at sea.

A4-3/job

Operation Order
COMSUBREFTT&TRAGRU KW OpOrd 15-55

d. Weather Unit

(1) Collect weather data and report at times indicated in Annex D.

4. a. This operation order is effective for planning purposes on receipt and for operations on 25 April 1955.

b. All units revert to normal Operation control when not actively engaged in this project.

c. Command relations and responsibility as described in Annex A.

d. Unless otherwise directed this operation will terminate at sunset 7 May 1955 at which time operation order will no longer be in effect and may be destroyed by burning. No reports of destruction required.

5. Normal logistic support for all units.

6. a. Communications in accordance with NWIP 16-1, local directives and ANNEX C.

b. Use Zone Roger (/5) time.

c. Commander Submarine Refitting and Training Group, Key West in USS BUSHNELL (AS15) at U.S.Naval Base, Key West, Florida.

W. R. LAUGHON
Captain, U. S. Navy
Commander Submarine Refitting & Training Group
Key West

Attachment (6)

Attachment 6

A4-3/job

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

ANNEXES

ANNEX A - Command Relations and Responsibility

ANNEX B - Concept of Operations

ANNEX C - Communications

ANNEX D - Weather

DISTRIBUTION:

CNO (1)

ONR (2)

COMSUBLANT (1)

CO USS BUSHNELL (1)

CO USS SENNET (2)

CO NAS BOCA CHICA (2)

CO VX-1 (1)

CO ZX-11 (1)

COMSURANTISUBDEVDET (1)

US FLEET WEATHER CENTRAL, MIAMI (Annex D only) (1)

PC 579 (1)

NOU (1)

CO USS ALBATROSS (EAMS-1)

SECRET

A4-3/job

Submarine Refitting & Training Group,
Key West

U.S.Naval Base,
Key West, Florida
15 March 1955

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

ANNEX A

COMMAND RELATIONS AND RESPONSIBILITY

1. Commander submarine Refitting and Training Group, Key West will be in overall command of this operation. Units assigned will report for Operational control on 25 April and will be released to normal commands during periods when they are not required for this project. All units will revert to normal commands on 8 May 1955.

2. The Office of Naval Research (Code 100) will be responsible for delivery of necessary equipment to the Key West area and will furnish COMSUBREFIT&TRAGRU Key West with a check-off list of all required equipment to facilitate assembly.

3. COMSUBREFIT&TRAGRU Key West will be responsible for installing helium charging equipment aboard SENNET.

4. COMSUBREFIT&TRAGRU Key West will be responsible for Search and Rescue until relieved by area Search and Rescue Commander (CO, NAS Boca Chica).

5. There will be no general release of information to the press on this project. COMNAVBASE Key West has accepted responsibility for making any releases that may be necessary. The Project Officer, ONR has accepted responsibility for providing a suitable release.

W. R. LAUGHON
Captain, U.S.Navy
Commander Submarine Refitting and Training Group
Key West

SECRET

Submarine Refitting & Training Group, Key West
U.S.Naval Base,
Key West, Florida
15 March 1955

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

ANNEX B

CONCEPT OF OPERATIONS

1. General

This project consists of launching a plastic balloon and embarded balloonist from the deck of a submarine and landing the balloon in a predetermined area. Three manned flights will be made, two in the early daylight hours followed by one prior to daylight. The balloon will be tracked during flight by one or two aircraft from VX-1, by radar aboard the tracking units, and by VHF direction finder units. A master plot will be maintained by COMSUBREFIT&TRAGRU Key West in BUSHNELL. All tracking units will report direct to COMSUBREFIT&TRAGRU Key West in the order given in paragraph 2 1. Recovery units will be vectored to the landing spot to make recovery. In the event of loss of contact, auxiliary units assigned will be called upon for assistance.

2. Detailed Schedule of Events (Weather reporting in Annex D)

a. COMSUBREFIT&TRAGRU Key West study long range weather forecasts to determine 24 hours in advance whether or not there is sufficient likelihood of suitable weather to warrant getting submarine underway.

b. 251300R April - Activate Tracking Units and check communications.

c. --1030R, after receipt of 1000R General forecast, if conditions are favorable, notify participating units to commence scheduled operations. Direct SENNET to proceed to estimated general area for launch.

d. --1600R, after receiving area forecast provide initial estimate of launching position.

e. --0400R, after receiving area forecast decide whether or not flight will be conducted.

f. --0500R request tracking aircraft to be on station at 0700.

g. ---April - SENNET confirmtime and position of launch. COMSUBREFIT&TRAGRU Key West relay time and posit to VX-1 and other units.

h. 0630R - Tracking unit activate and check communications.

i. 0650R - High speed AVR assume standby status and report ready to get underway.

j. 0700R - Tracking aircraft on station.

Enclosure (3) (b) Attachment 6

A4-3/job

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

ANNEX B

CONCEPT OF OPERATIONS

k. 0700R - SENNET launch balloon, donfirm posit and report actual zero time.

l. Actual zero time plus 15 minutes - Tracking units report balloon posit to COMSUBREFIT&TRAGRU Key West in following order:

Tracking aircraft
SENNET
PC 579
ALBATROSS
NAS Boca Chica
BUSHNELL
If not in contact units so state. If in contact report position in range and bearing from Sand Key Light. Aircraft use any suitable reference point if not in sight of Sand Key.

m. Actual zero time plus 30 minutes - Report posit as in (l) above and every 15 minutes thereafter until recovery is effected.

n. When balloon course is established COMSUBREFIT&TRAGRU KW will vector recovery units to predicted landing area.

o. When recovery is completed, COMSUBREFIT&TRAGRU KW will issue dispatch instructions to proceed Key West or take station for next launch.

p. For subsequent launches repeat schedule outlined in items (c) through (o), except that the predicted launching time for the darkness flight is 0430R.

W. R. LAUGHON
Captain, U. S. Navy
Commander Submarine Refitting & Training Group
Key West

COMMUNICATIONS
FREQUENCY PLAN

	UNITS			FREQUENCIES				
	FIRING	TRACKING	RECOVERY	GI5 2226 kcs V	T52(385.8)	E12m(243.0	GibsonGirl 466 Kcs	VOCIE CALL
BALLOON * # $	X	X	X	(Asnecessary to talk to accompanying AD)				KINGS[illegible]
SENNET (SS408)	X	X	X	G	G	Gd	C	GOODSPEED
BUSHNELL (AS15)		X		G	G	Gd	C	ELBOW DOG
PETREL (ASR14)		X		G	G	Gd	C	BACARDI GEORGE
ALBATROSS (EAMS-1)*		X	X	G	G	Gd	C	HARTFIELD X-RAY
PC 579 *		X	X	G	G	Gd	C	OWE 579
AD's		X			G	Gd		(No__)EYESIGHT
XL's			X		G	GD		(No__)PRES
HO4's			X		G	Gd		(No__)BRUISE
AVR's *			X	G				KINGSBURY ([illegible]
NAS BOCA CHICA		X		(All communications between NAS Boca Chica and COMSUBREFIT&TRAGRU KW via telephone)				

* Will carry PRC-10 radio (38-55 mcs)
#Will carry PRC-17 radio (243.0 mcs,121.5 mcs)
$Will carry LF beacon (1676 kcs) and VHF Beacon (124.5 mcs)

NOTE:

G = GUARD

Gd = GUARD (When directed)

C = COVER

W.R.LAUGHON
Captain U.S.Navy

SECRET

Enclosure(3) (b) Attachment 6

SECRET

A4-3/job

Submarine Refitting & Training Group, Key West
U. S. Naval Base,
Key West, Florida
15 March 1955

Operation Order
COMSUBREFIT&TRAGRU KW OpOrd 15-55

ANNEX D

WEATHER

1. General

Accurate weather information is mandatory for the success of this project. To obtain this information, CNR will arrange for direct TWX communications with U.S. Fleet Weather Center, Miami. In addition local weather observations will be taken and reported by National Park Service personnel at Dry Tortugas, Aerology NAS Boca Chica and SENNET.

2. Weather forecasts will be delivered to COMSUBREFIT&TRAGRU KW in accordance with the following schedule:

U.S.Fleet Weather Central, Miami

General Forecast - 1000R
Area Forecast - 1600R and 0400R to include wind and speed direction at 2000 feet intervals from the surface to 20,000 feet.
Addbional forecast as necessary.

Aerology, Boca Chica

Local Rawin sounding at 2200R and 1000R (Results should be received in one hour).
Pibal observations at 0400R and 1600R or at times requested.

Dry Tortugas

Surface observation - 0700, 1300, 1900 (Information to be transmitted via Coast Guard)

W. E. LAUGHON
Captain, U.S. Navy
Commander Submarine Refitting & Training Group
Key West

SECRET

SECRET

30:jgb

SUBMARINE REFITTING AND TRAINING GROUP
U. S. NAVAL STATION
KEY WEST, FLA

FS2/3h
A4-3/1
Ser:001
25 April 1955

From: Commander Submarine Refitting and Training Group, Key West, Florida
To: DISTRIBUTION LIST

Subj: COMSUBREFIT&TRAGRU KWEST Secret OpOrd 15-55 of 15 March 1955; CHANGE NO. 1

1. The following corrections are promulgated herewith for the subject OpOrd:

a. Annex A - Command Relations - add new paragraph 6:

"6. a. COMSUBREFIT&TRAGRU KWEST will direct SENNET to take initial position. Upon receipt of advice from ONR representatives in BUSHNELL and SENNET, he will direct SENNET to take preliminary launching station. Upon receipt of advice from ONR representatives in SENNET he will further direct SENNET to take final launching position and to launch at a given hour. He will select the final launching position so that the balloon will drop in area 5 or 6. He will arrange for the arrival of tracking aircraft prior to the launch and will coordinate the tracking of the balloon in USS BUSHNELL. He will transmit instructions to the balloonist based on advice from the ONR balloonist in BUSHNELL. He will station recovery vessels as close as possible to the position to the position of drop estimated by the ONR balloonist in BUSHNELL. He will request assistance from other units in the area and actuation of the Search and Rescue Organization as necessary."

"b. ONR representatives in SENNET will prepare the balloon for ascent, assisted by SENNET. They will obtain final weather data, assisted by SENNET. They will report via CO SENNET when they consider all conditions satisfactory for launch."

"c. The balloonist will report to CO SENNET when he is satisfied that conditions are favorable and he is ready to make the flight. During flight he will receive advice from COMSUBREFIT&TRAGRU KWEST which he will act upon at his discretion."

"d. COMSUBREFIT&TRAGRU KWEST will make the decision as to whether operations shall be conducted, based on the advice of ONR representatives and present local conditions. After permission has been granted to conduct operations, the decision as to whether and when to launch is at the discretion of the CO SENNET and the balloonist."

b. Paragraph 3.b. - add new sub paragraph (8):

"(8) Aircraft track at same altitude as balloon and record data on form provided at fifteen minute intervals."

FG2/KW
A4-3/1
Ser:001
25 April 1955

Add new sub paragraph (9):

"(9) Units concerned take and record data on forms provided."

c. ANNEX B - paragraph 1 - add new sentence:

"The balloon has a silvery color in the sunlight and should be easily detected visually."

d. ANNEX C - Communications - add the following notes:

NOTE 1: The characteristic signal of the VHF Beacon will be 20 secs on, 5 secs off, 20 secs on, 17 secs off. The signal for the LF Beacon will be 20 secs off, 15 secs on, 2 secs off, 15 secs on."

NOTE 2: One AD will be in communication with balloon on 227.8 mcs and the other AD will report position on 385.8 mcs."

Also in Annex C: Delete PRC 10 and PRC17 where appearing and substitute PRC 14 installed in balloon, frequency 227.8 mcs, or in emergency 243.0 mcs.

e. In Task Organization under tracking unit add: FAWTULANT

f. Paragraph 3.b. add new sub paragraph (10): FAWTULANT assist AD'S. in reporting position of balloon using GCI.

W. R. LAUGHON

DISTRIBUTION:

CO USS BUSHNELL (1)
CO USS SENNET (2)
CO NAS BOCA CHICA (2)
CO VX-1 (1)
CO ZX-11 (1)
COMSURFACE ANTISUBDET (1)
PC 579 (1)
NOU(2)
CO USS ALBATROSS (EAMS-1) (1)
FAWTULANT BOCA CHICA (1)

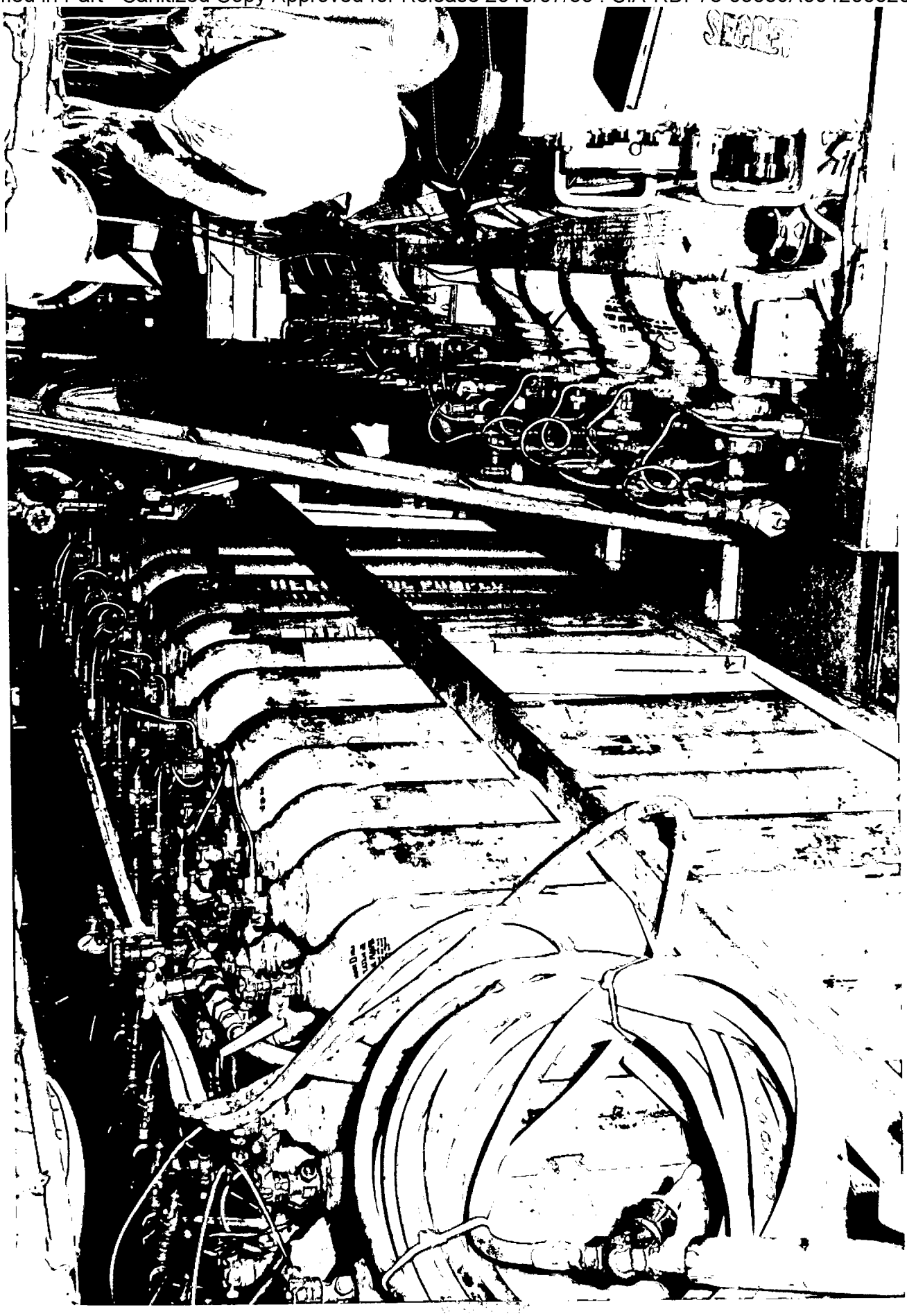
Enclosure (3)(b)Attachment 7

Enclosure (3)(C)

PHOTOGRAPHS OF EQUIPMENT
(Photographs Appended)

Photograph No.	Subject of Photograph
1.	Arrangement of helium cylinders with manifold systems.
2.	Cribbing of helium cylinders in starboard bank of horizontal bottles.
3.	Radar weather balloon, night release.
4.	Tracking pibal with theodolite, light on pibal - night.
5.	Radar reflectors on weather balloon.
6.	Deck cloth, beginning lay-out on deck.
7.	Deck cloth with gondola.
8.	Deck cloth with gondola and packed balloon.
9.	Deck cloth with gondola and ballast.
10.	Gondola, variometer and two-man pneumatic raft.
11.	Inflating balloon.
12.	Partially inflated balloon.
13.	Weighing-off balloon.
14.	Weighing-off and testing balloon valve.
15.	Inflating pillow balloon for beacon antenna.
16.	Blimp and balloon in flight, prior to touchdown.
17.	Balloon descending, tracking plane (Navy AD-type) circling.
18.	Balloon and gondola after pickup by air-sea rescue craft.
19.	Balloonist removing Army-type colbar suit after pickup.

Photograph No.	Subject of Photograph
20.	Colbar suit, instruments, and balloon after pickup.
21.	Equipment from right to left; Two-man pneumatic raft; Gibson Girl equipment; cameras; gondola; watertight salvage containers; and two gondola decks.
22.	BuAir-type anemometer.
23.	Variometer, altimeter, and compass.
24.	K-20 aerial camera, oblique, 15" lens, and film.
25.	K-20 camera, 63/4" lens, for verticals - modified.
26.	Same as above, mounted in gondola floor.
27.	Same as above.
28.	Food packets, survival, artic. (2 weeks reduced rations).
29.	Voice recorder, used on one flight.
30.	ELINT radar detector, with two pickups.
31.	PRC-10, for stand-by. (Not used).
32.	PRC-14 and battery, special ground plane antenna, face mask, switch, loud speaker, ear set.
33.	LF beacon and 270° antenna, VHF beacon and antenna.
34.	Gibson Girl equipment.
35.	Variometer, altimeter, clock, and thermometer.
36.	Life vest (Mae West).
37.	Oxygen equipment.
38.	Variometer.
39.	Watertight salvage container for K-20 camera and other equipment.
40.	URD-2A Radio Direction Finder (VHF).



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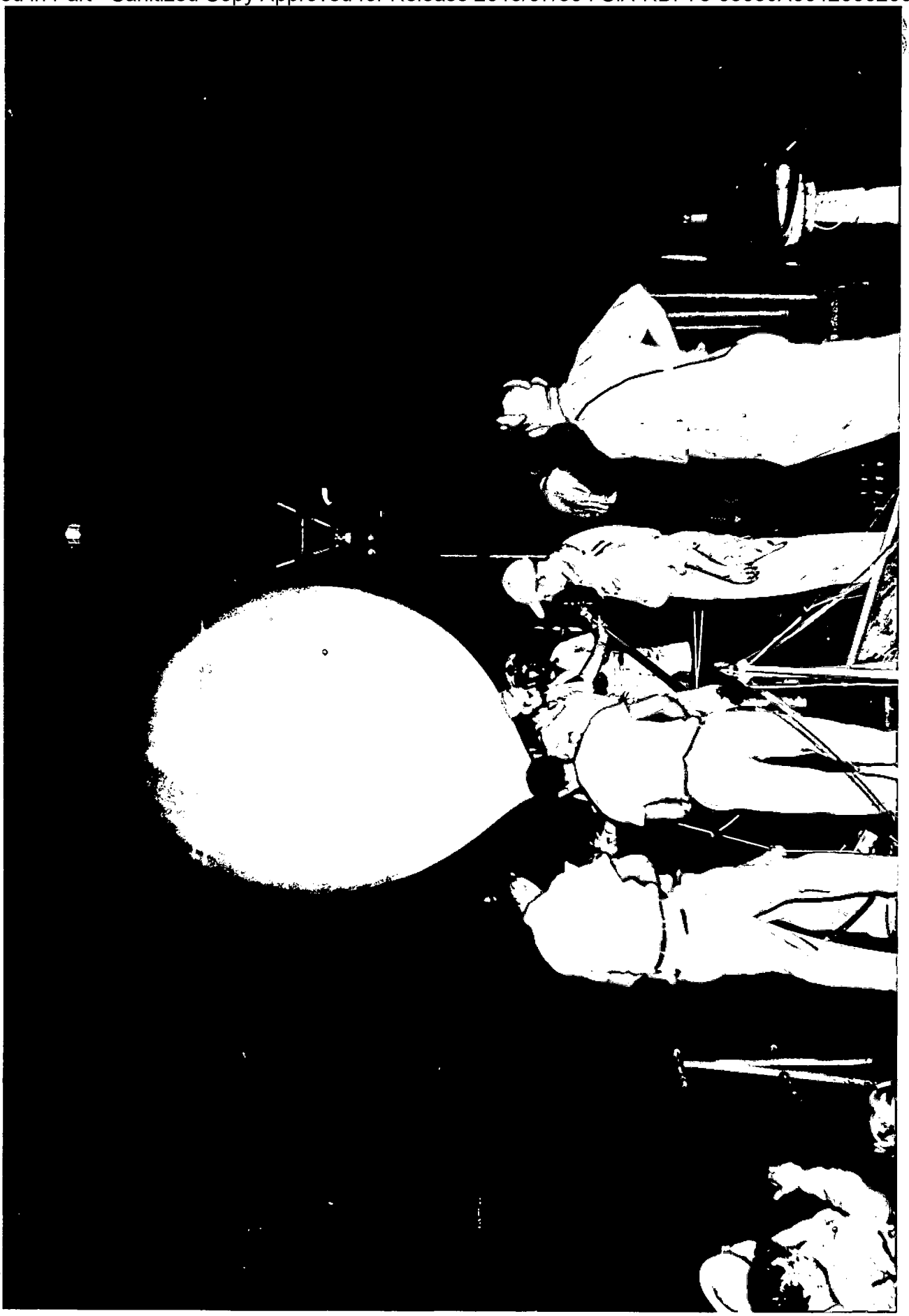

Declassified in Part - Sanitized Copy Approved for Release 2013/07/30 : CIA-RDP78-03639A001200020001-9

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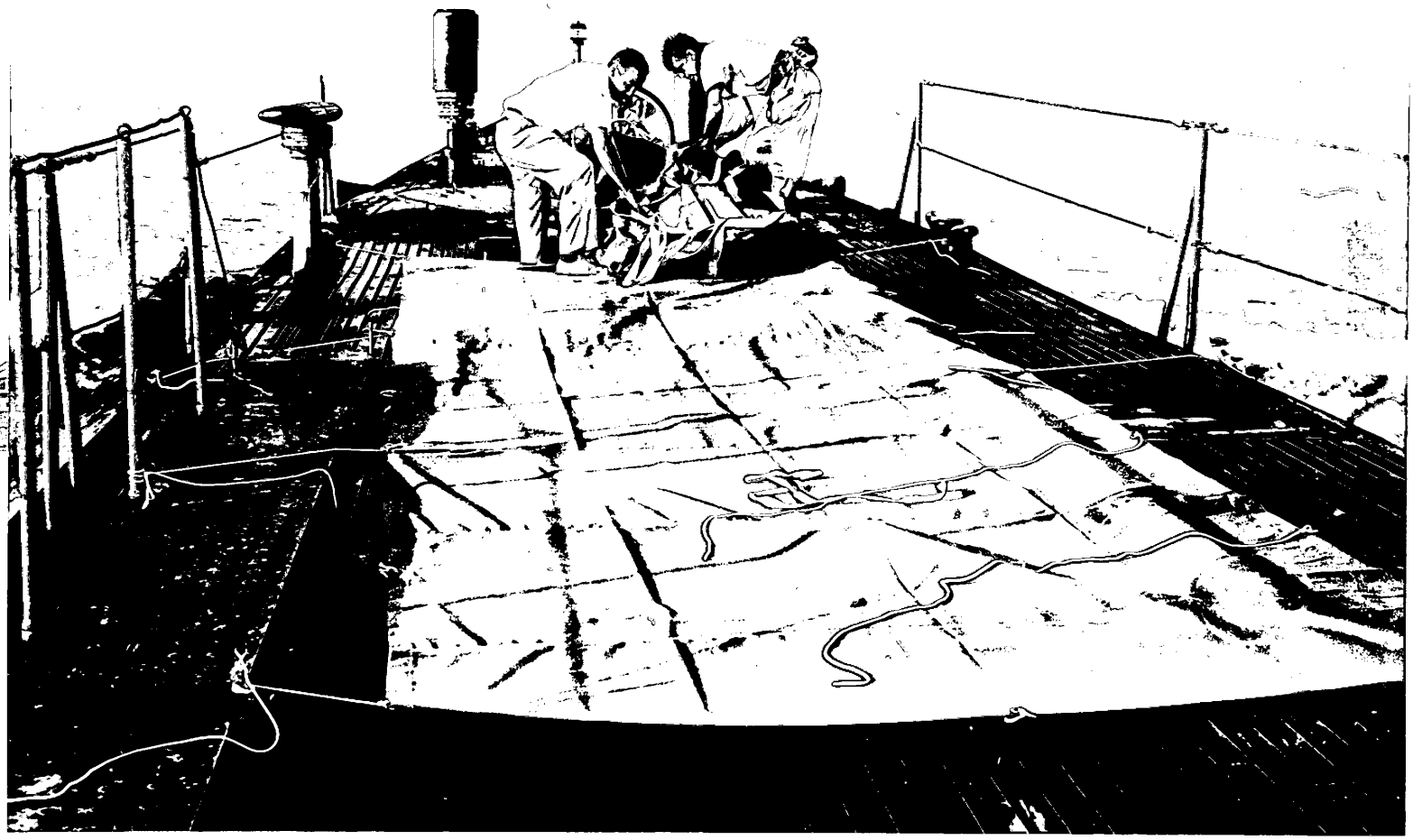

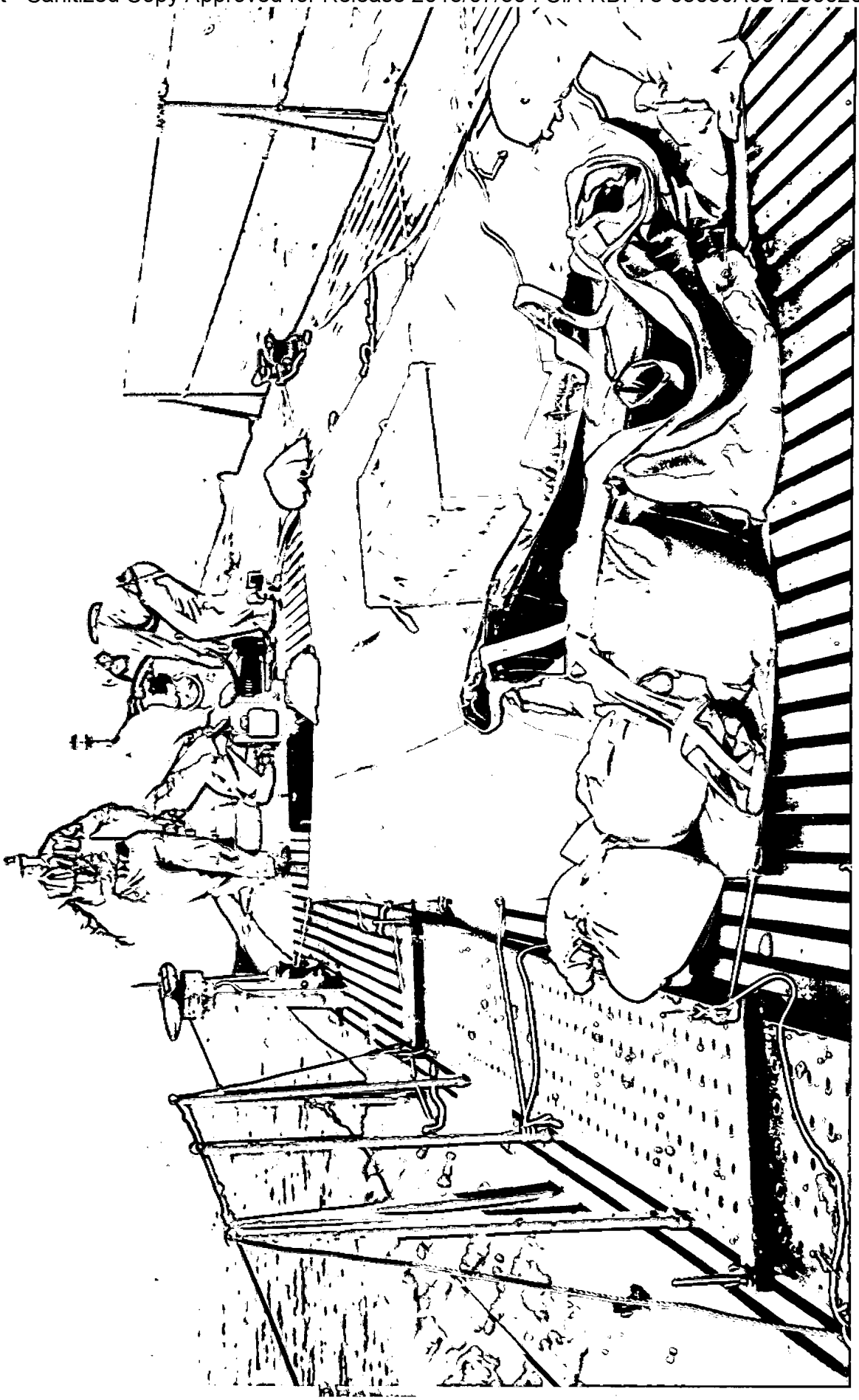

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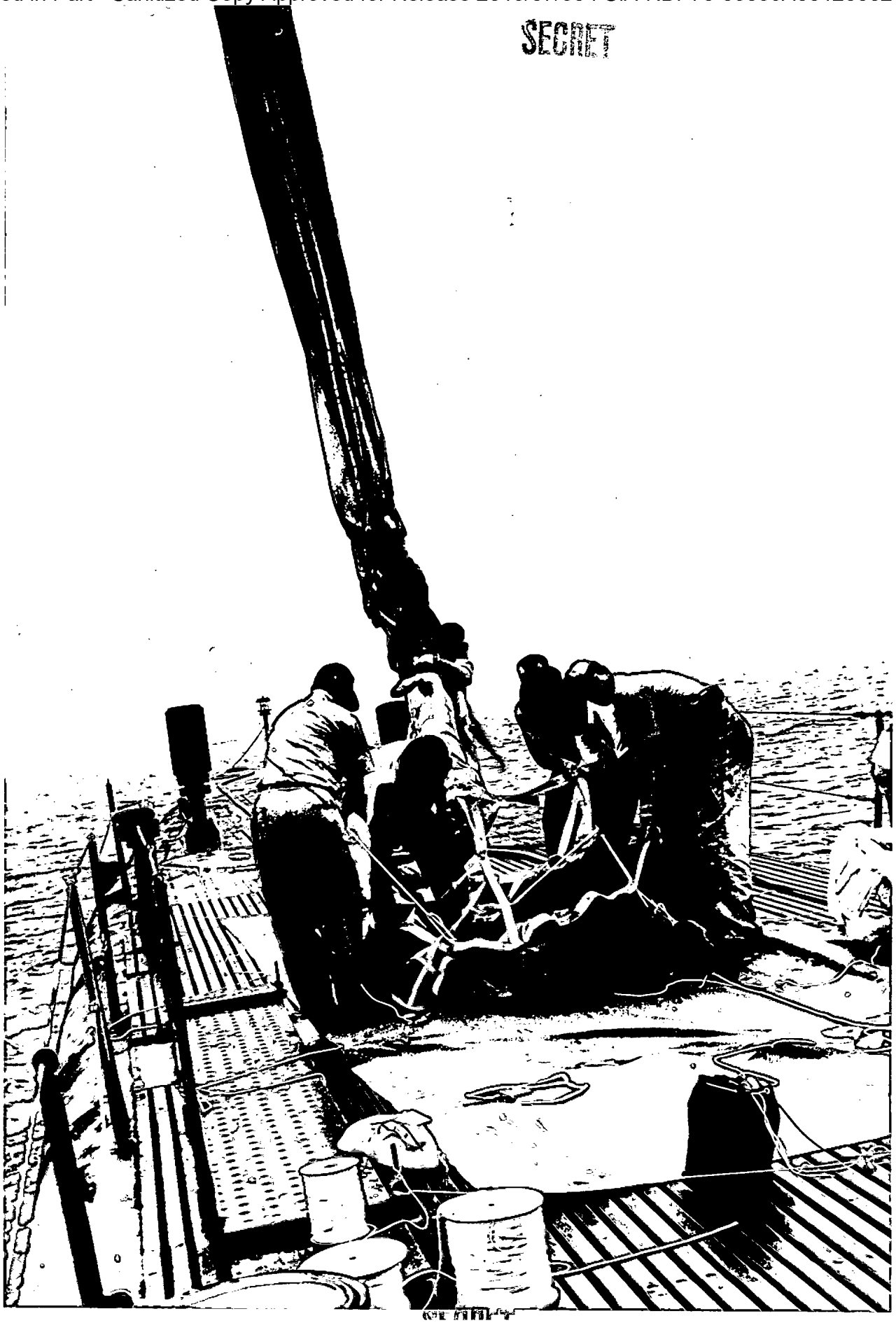

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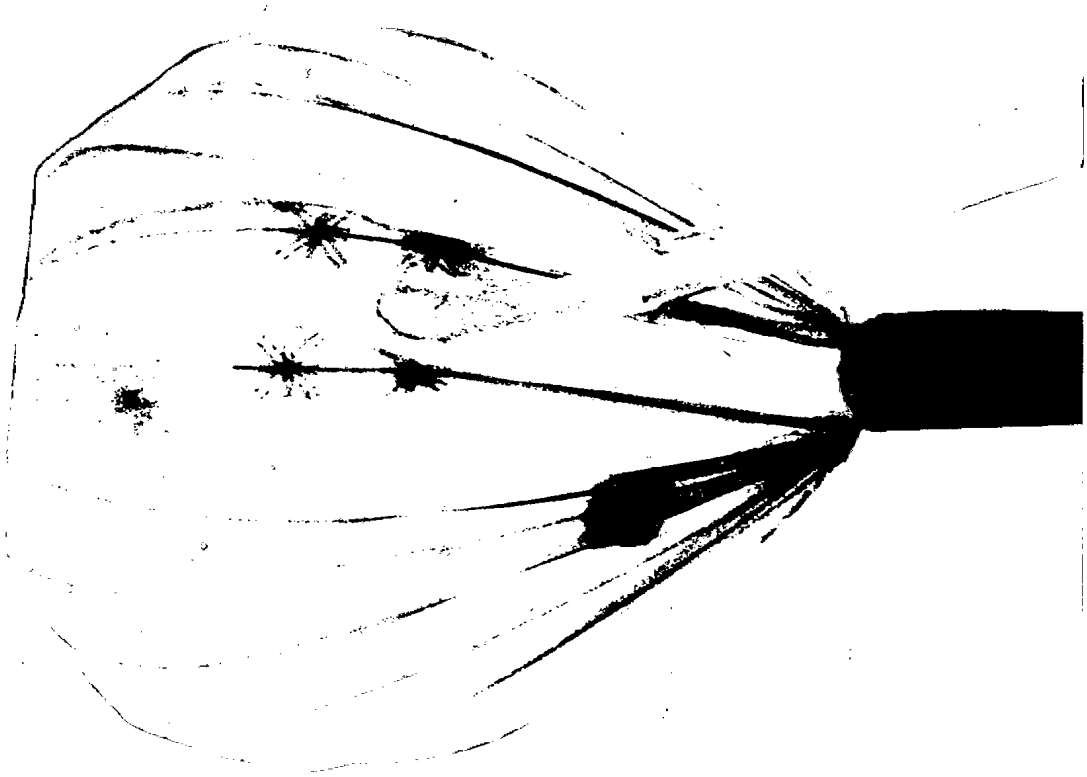

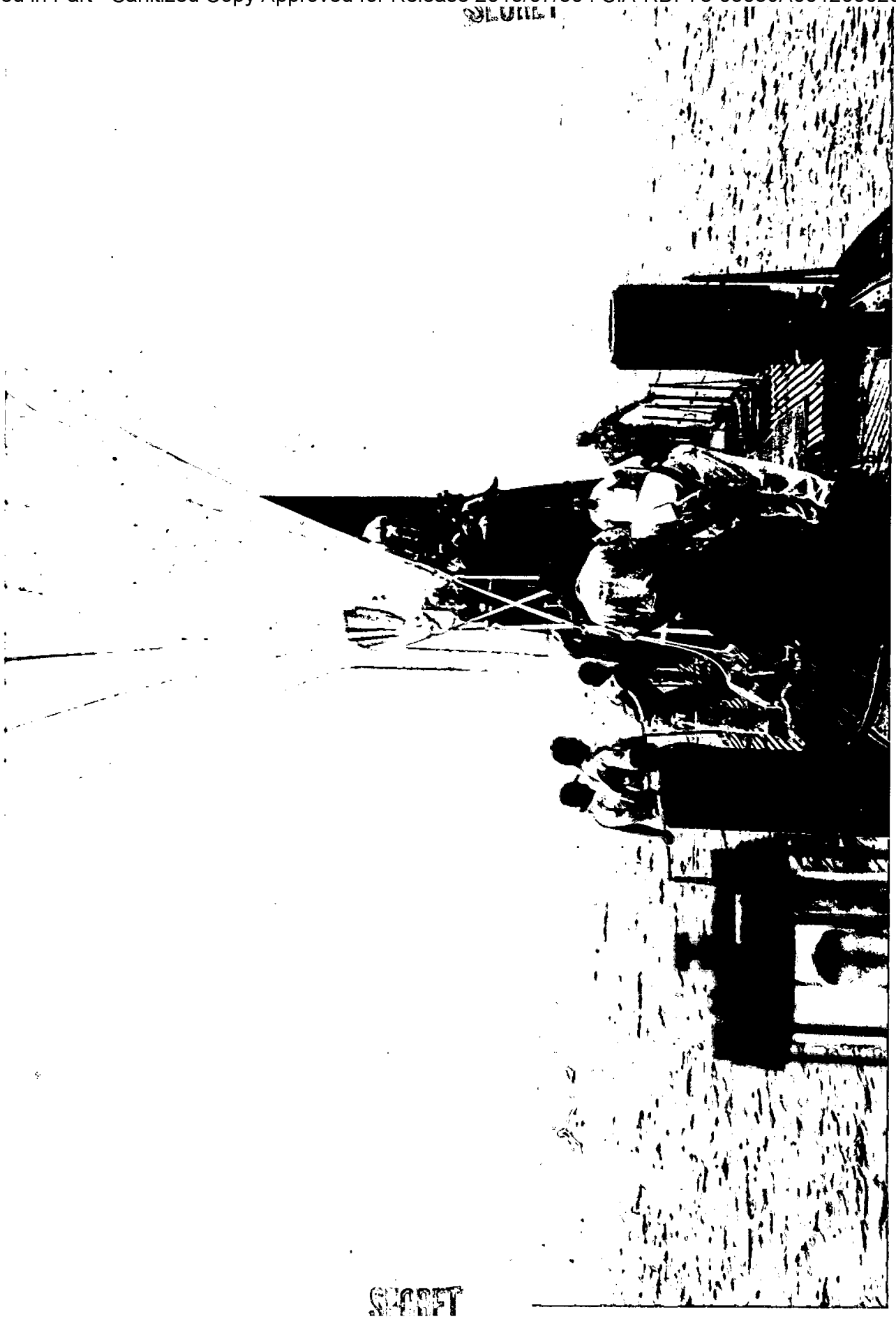

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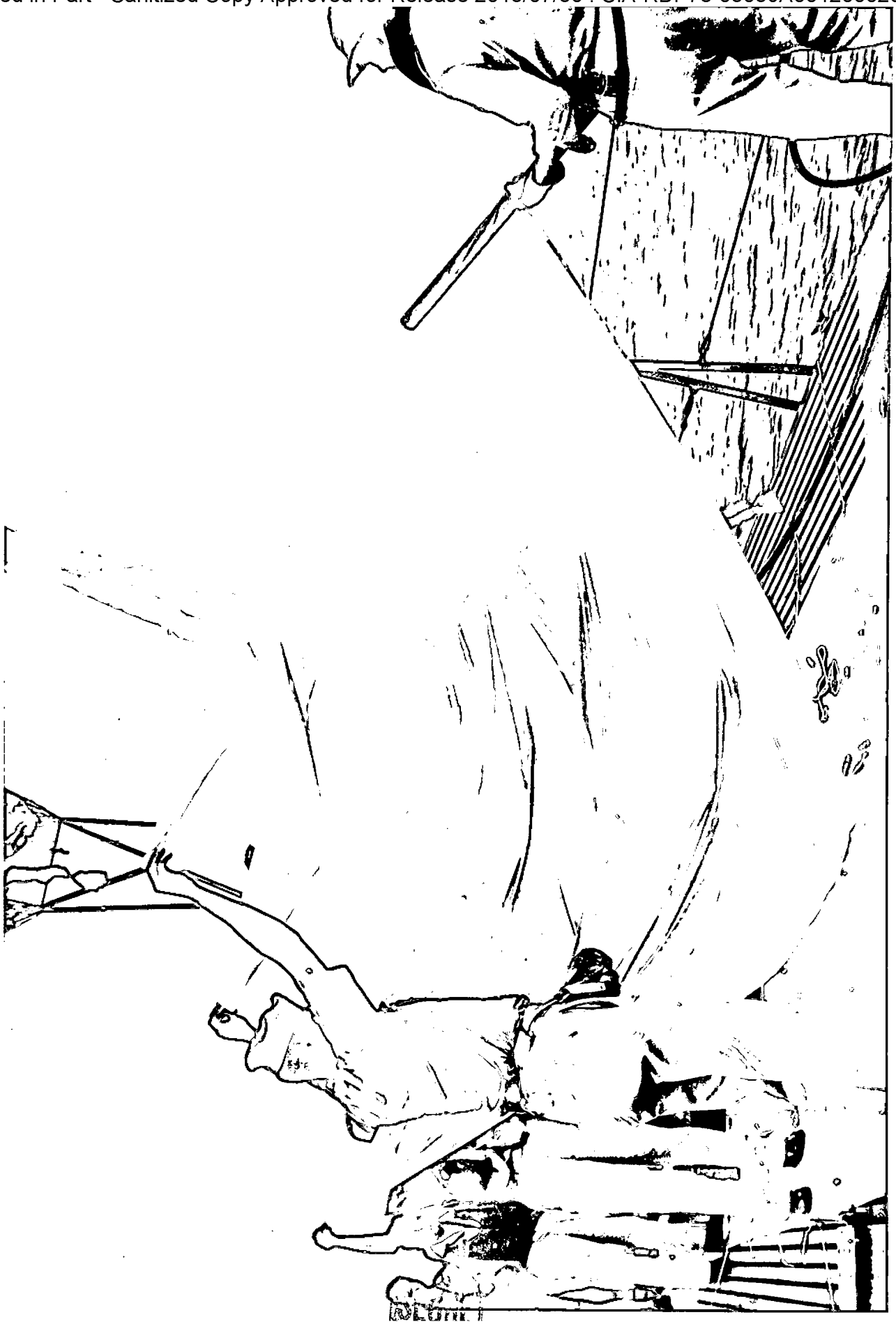

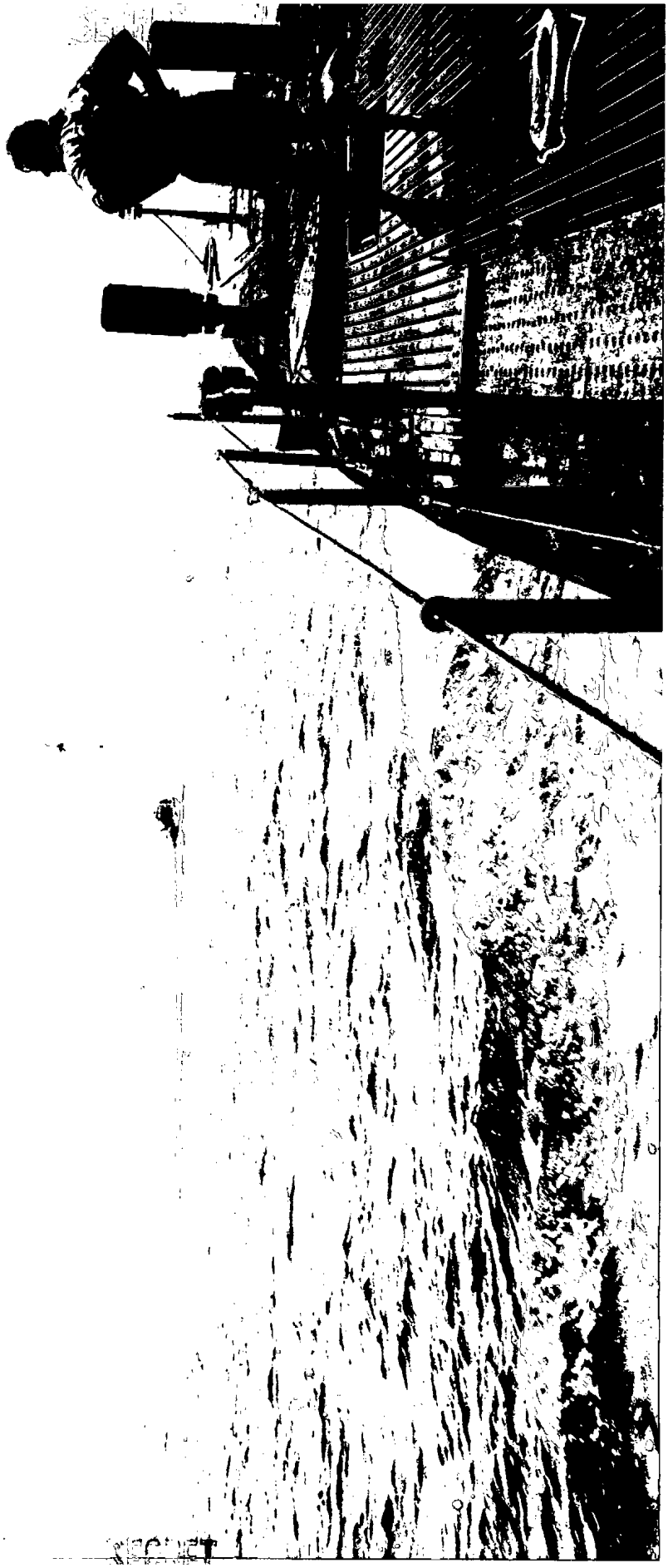

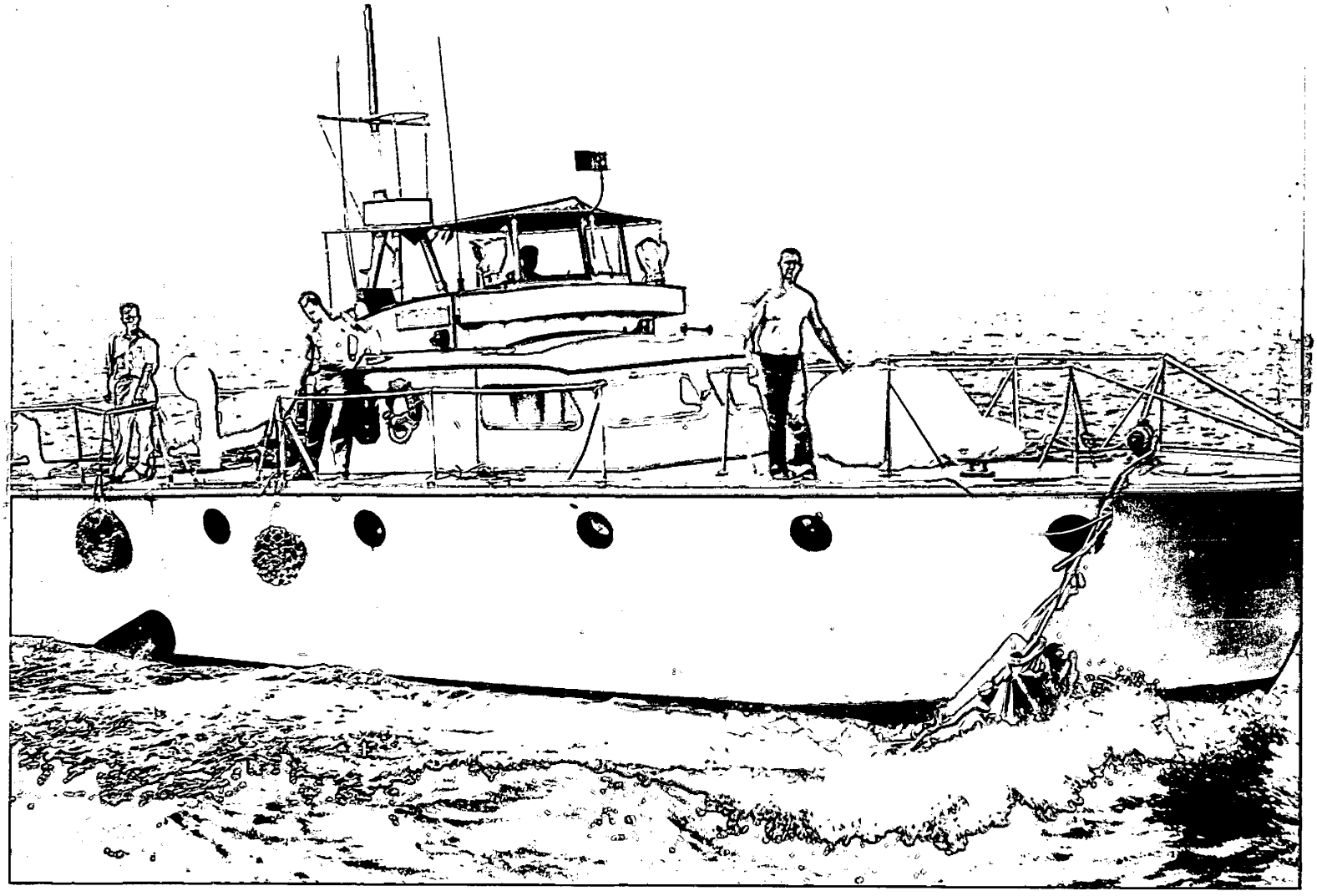

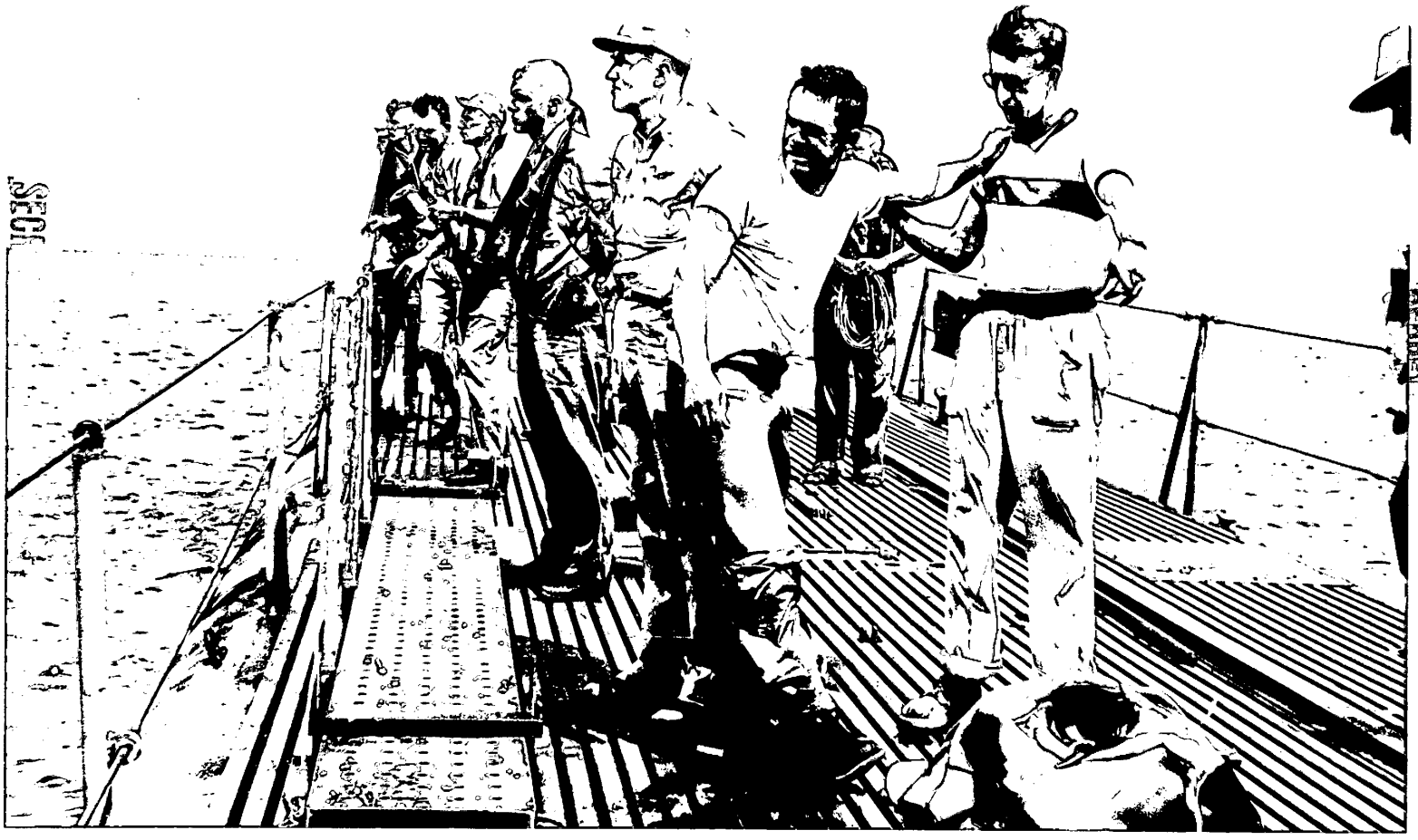

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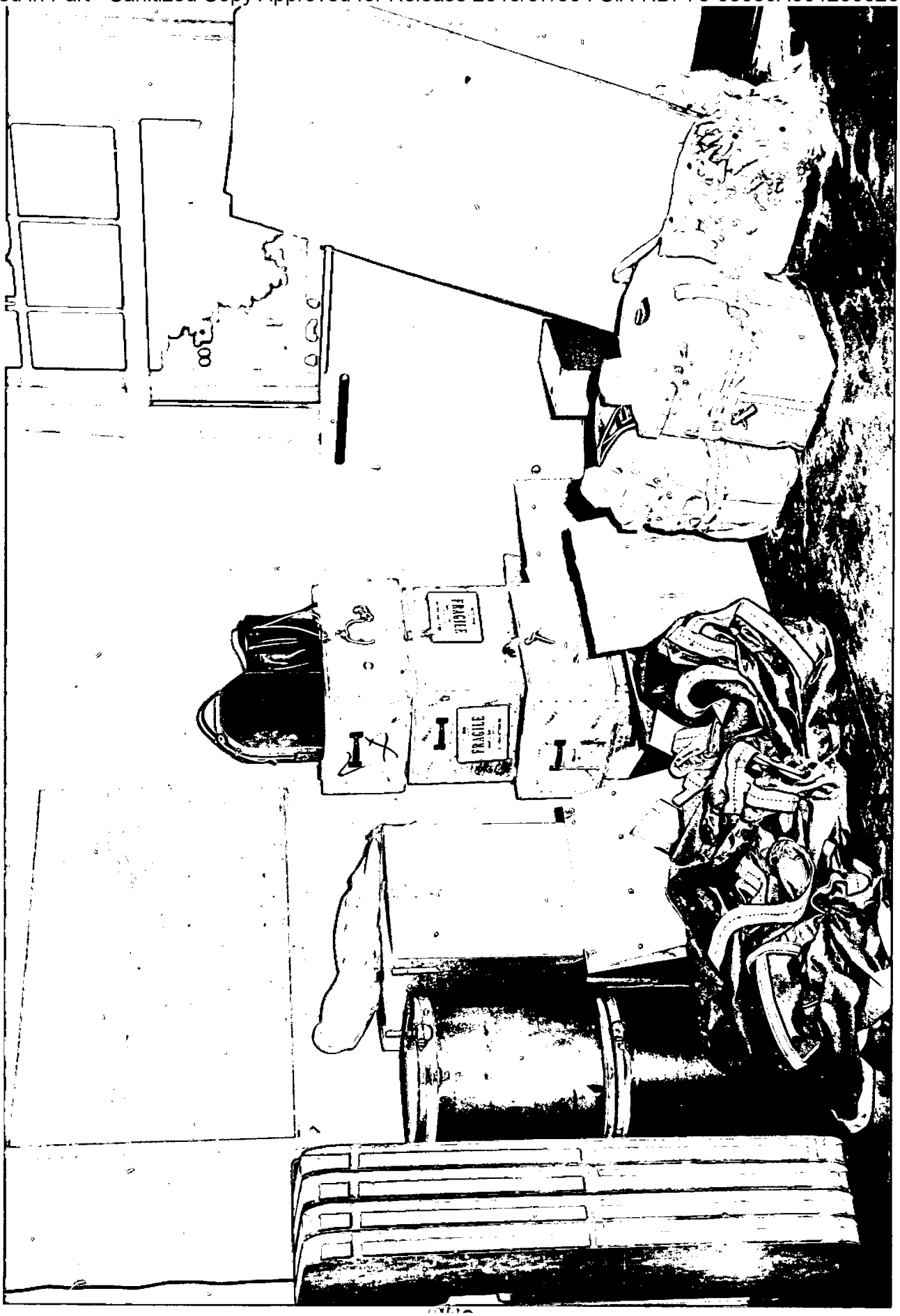

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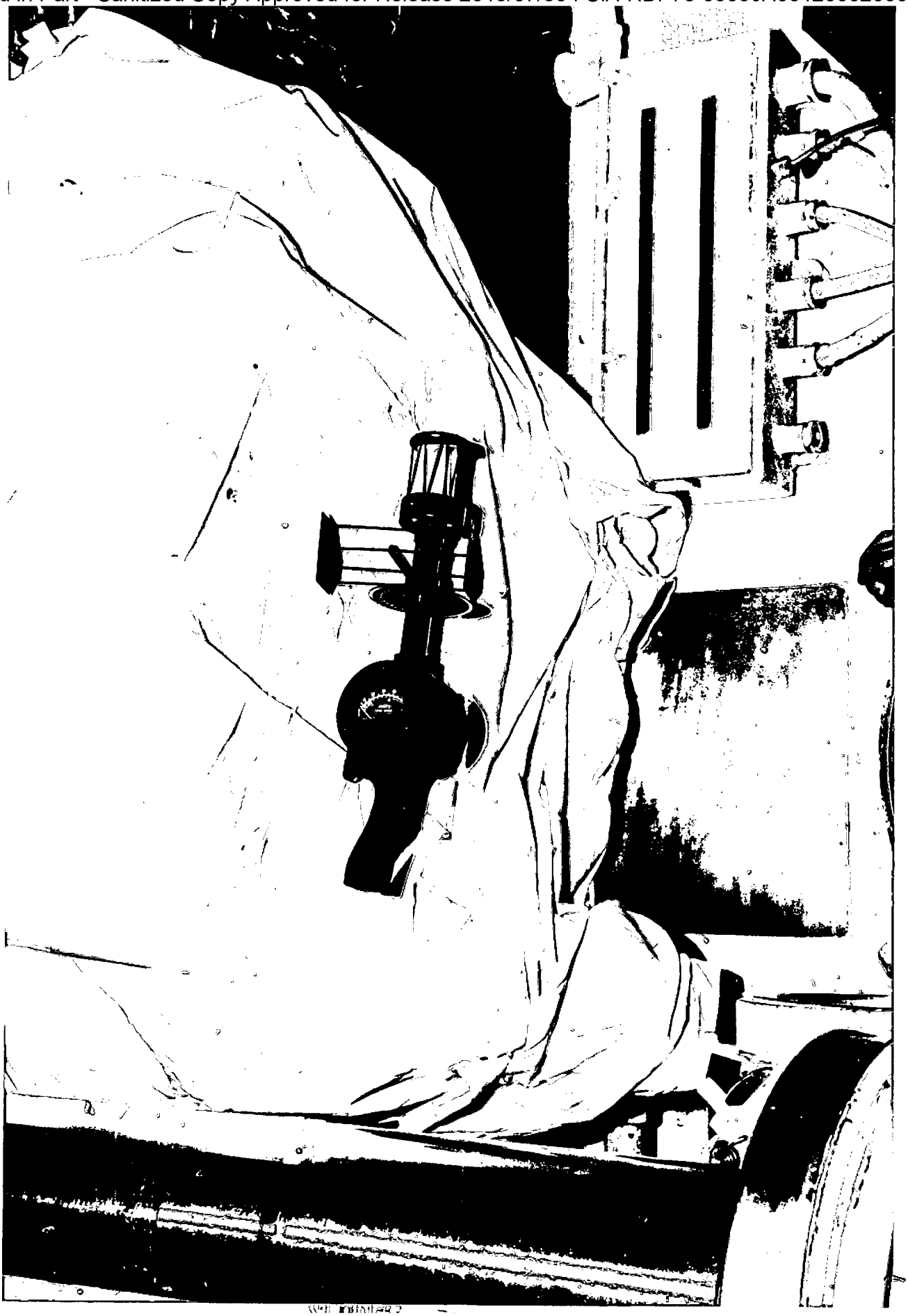

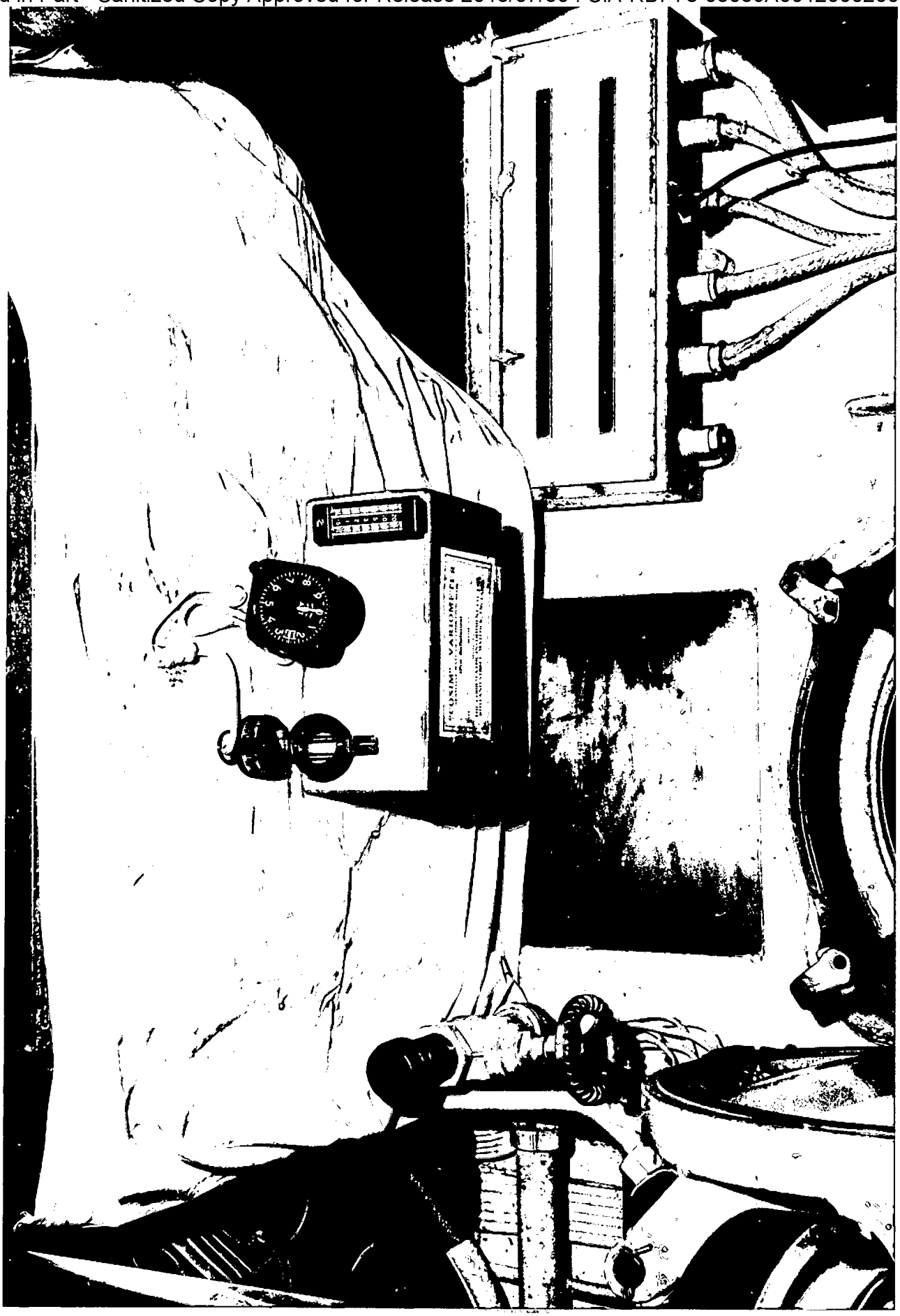

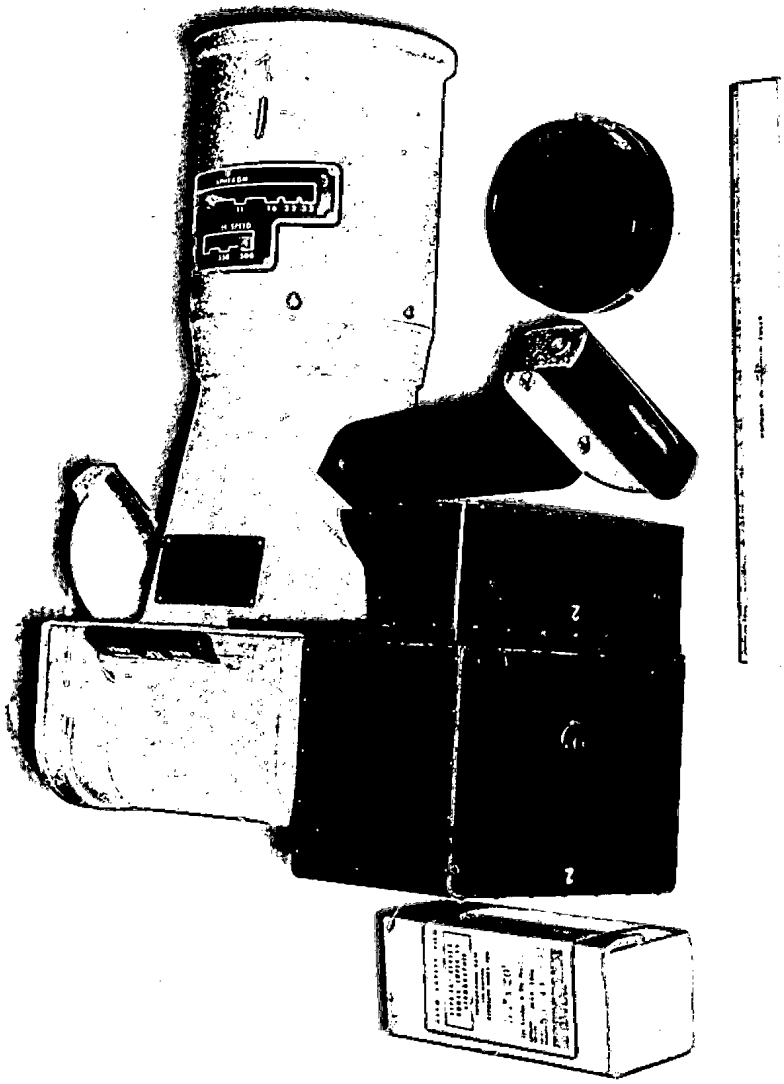

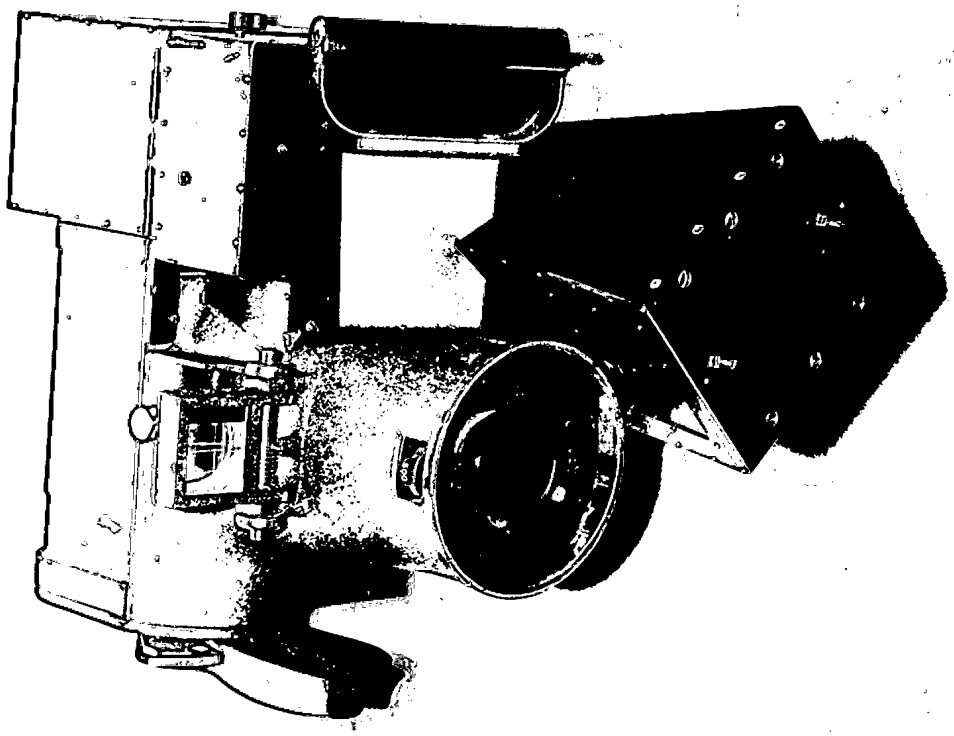

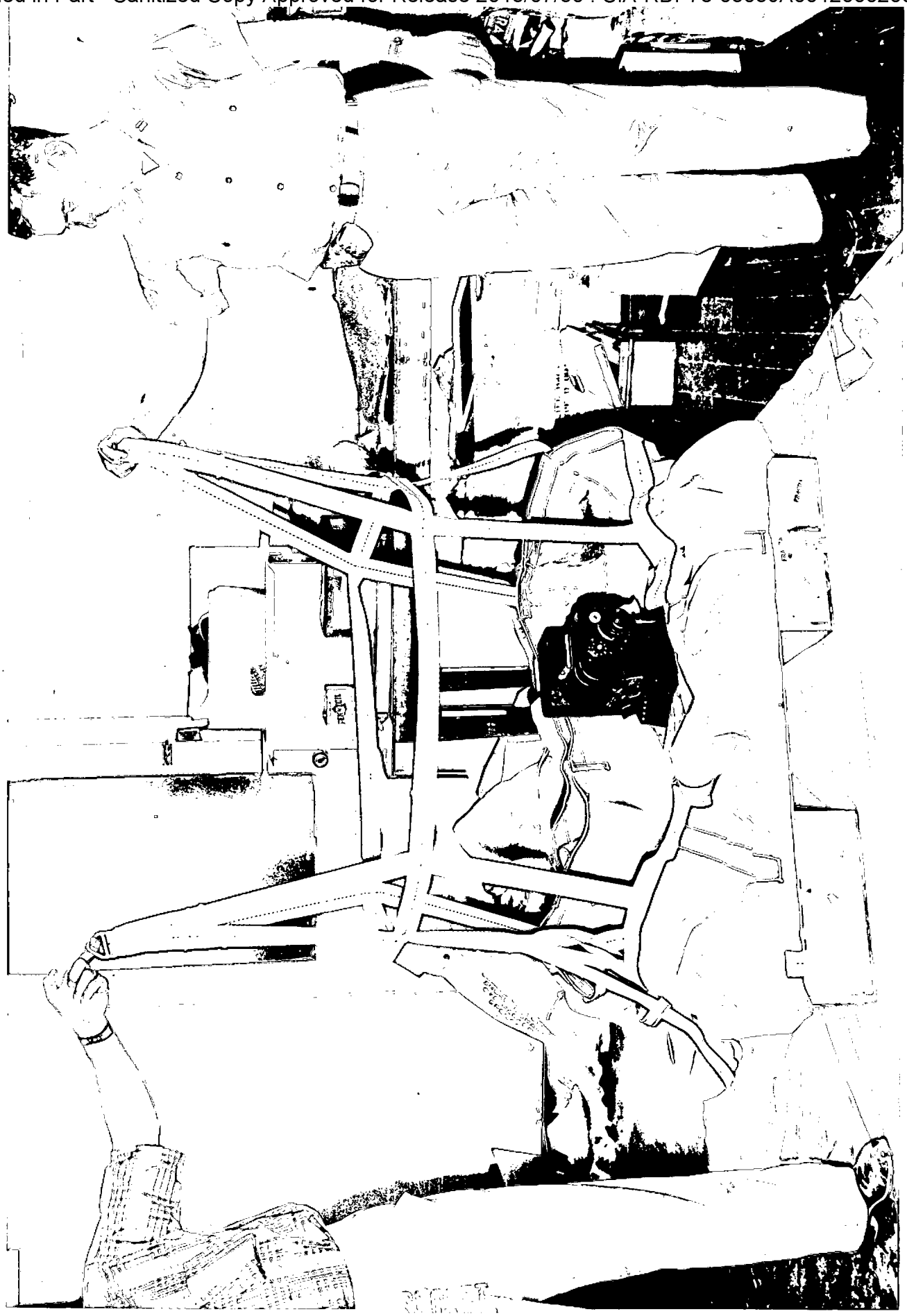

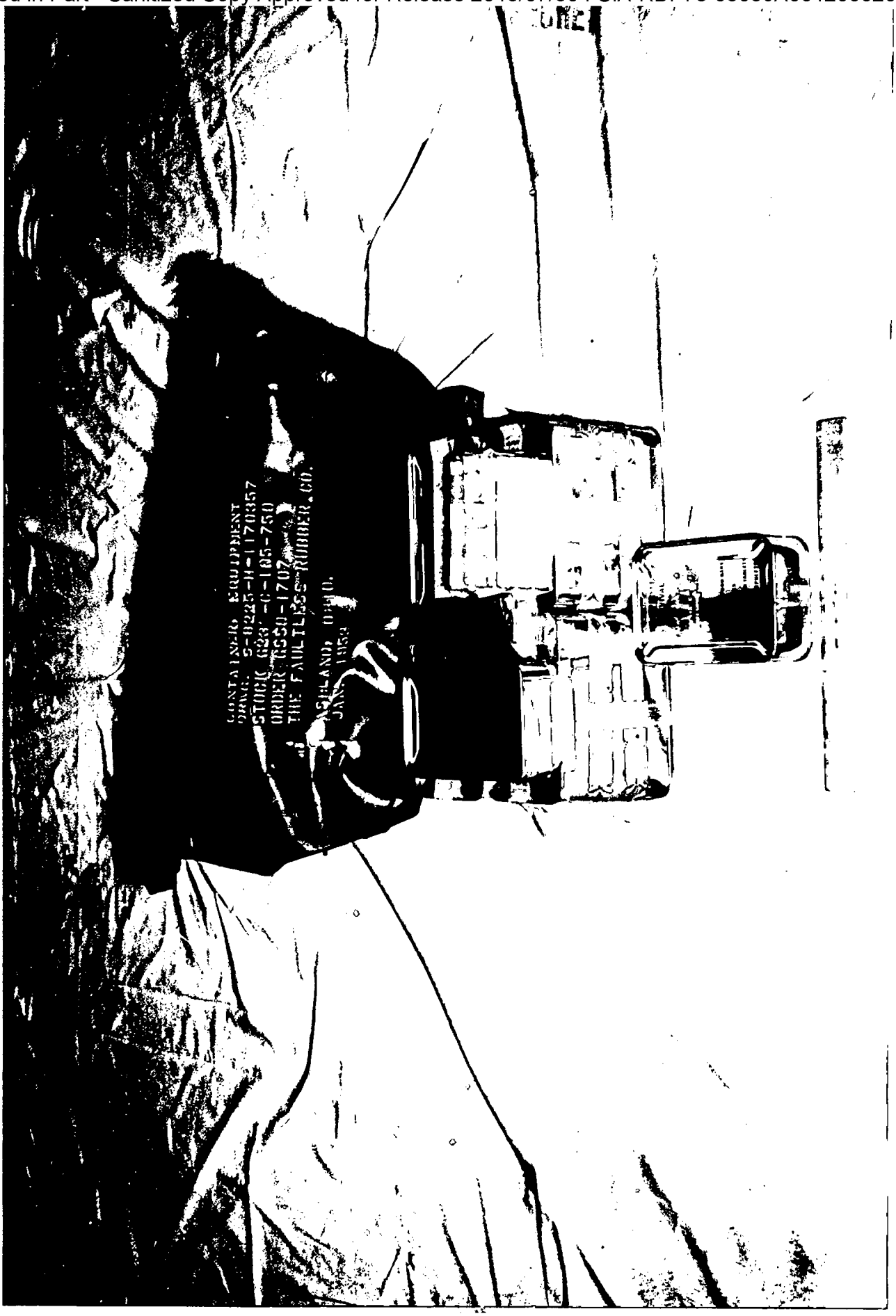

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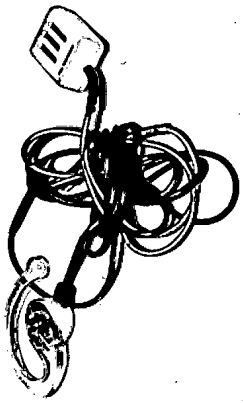

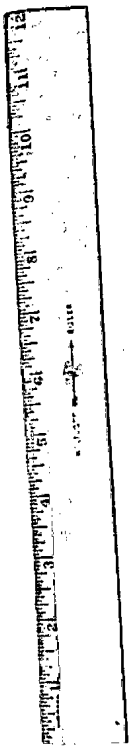

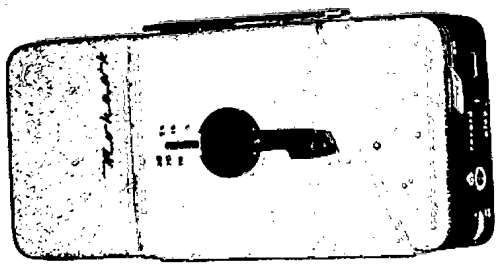

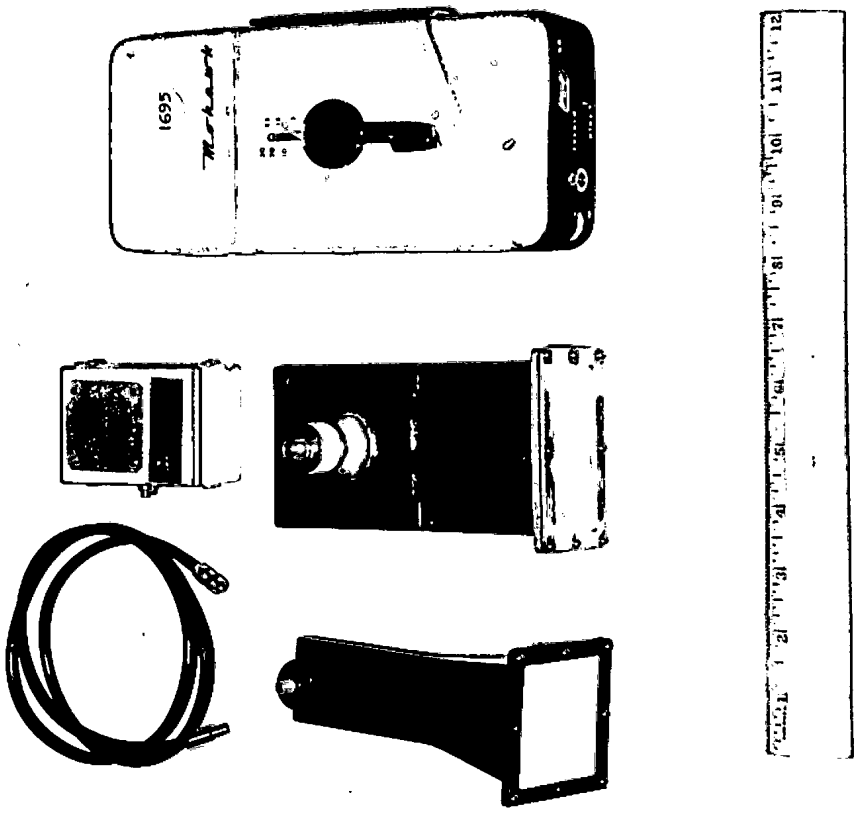

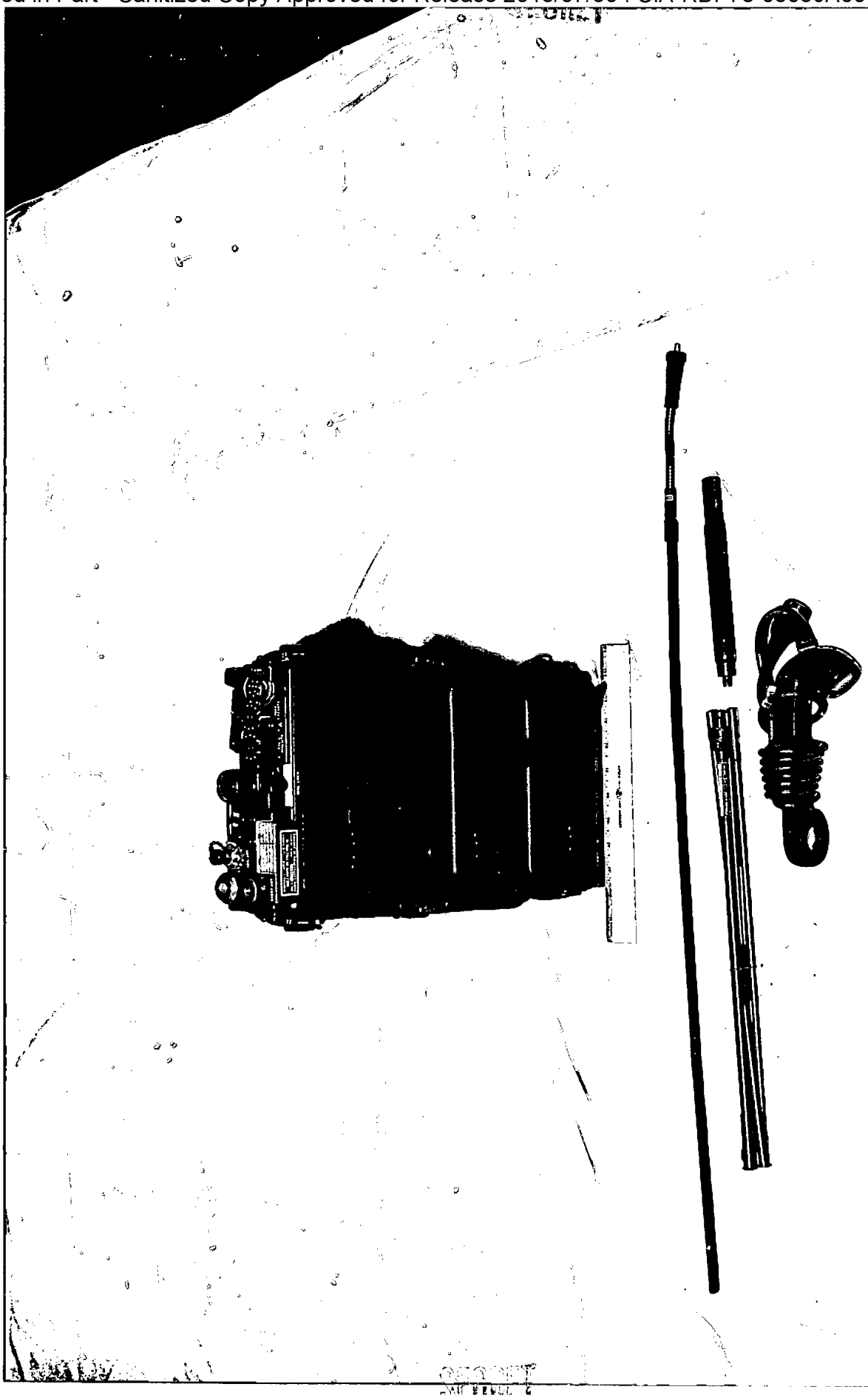

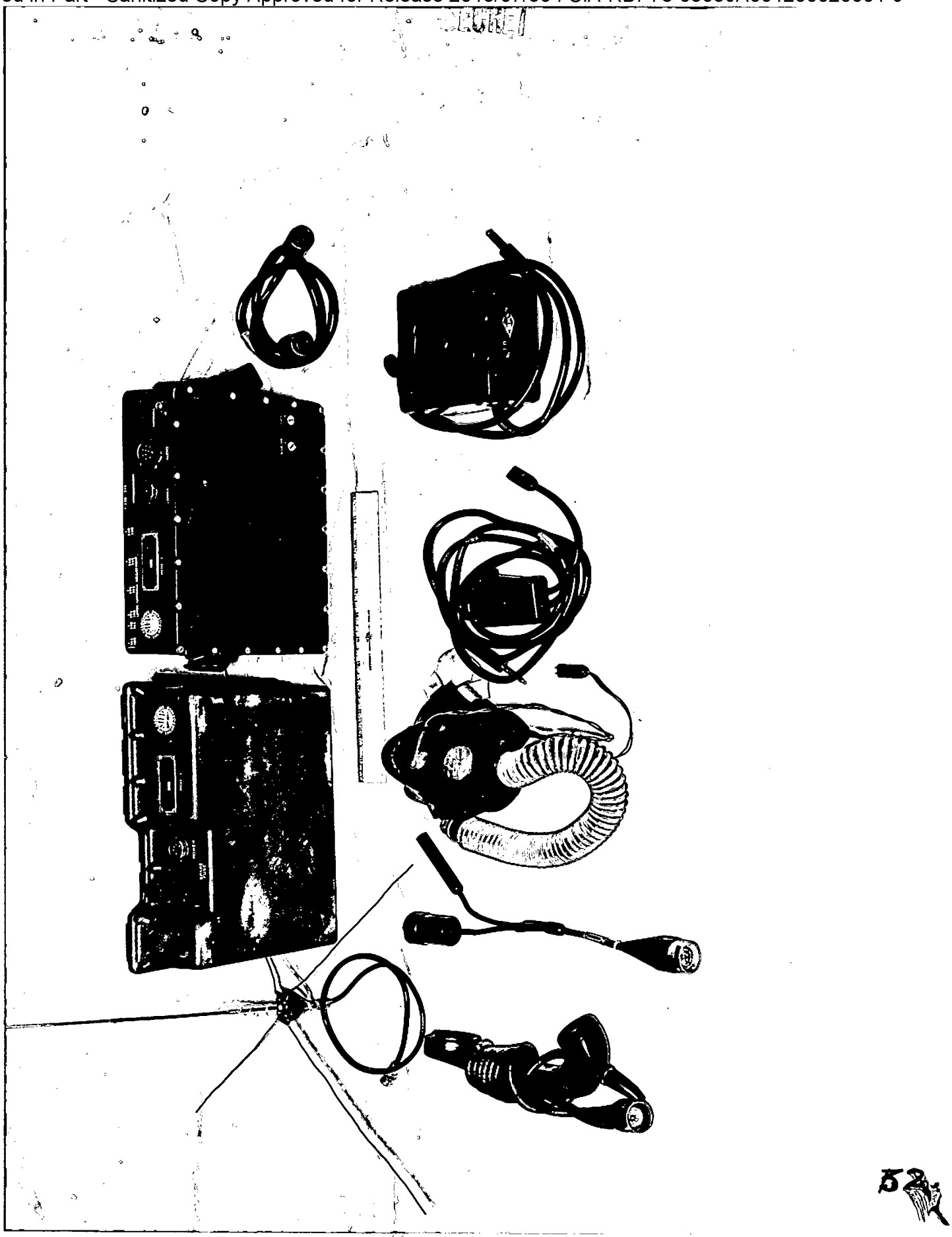

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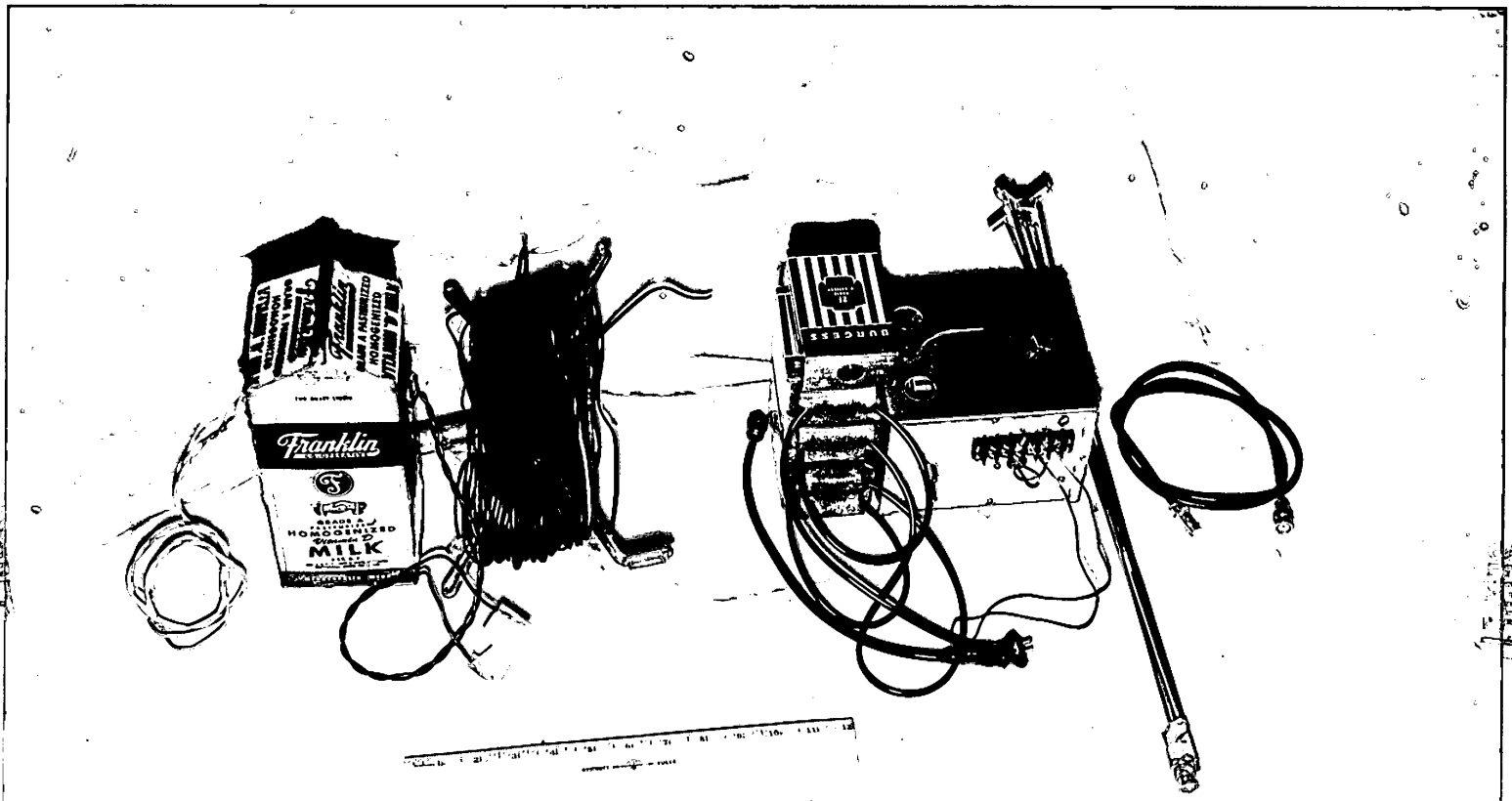

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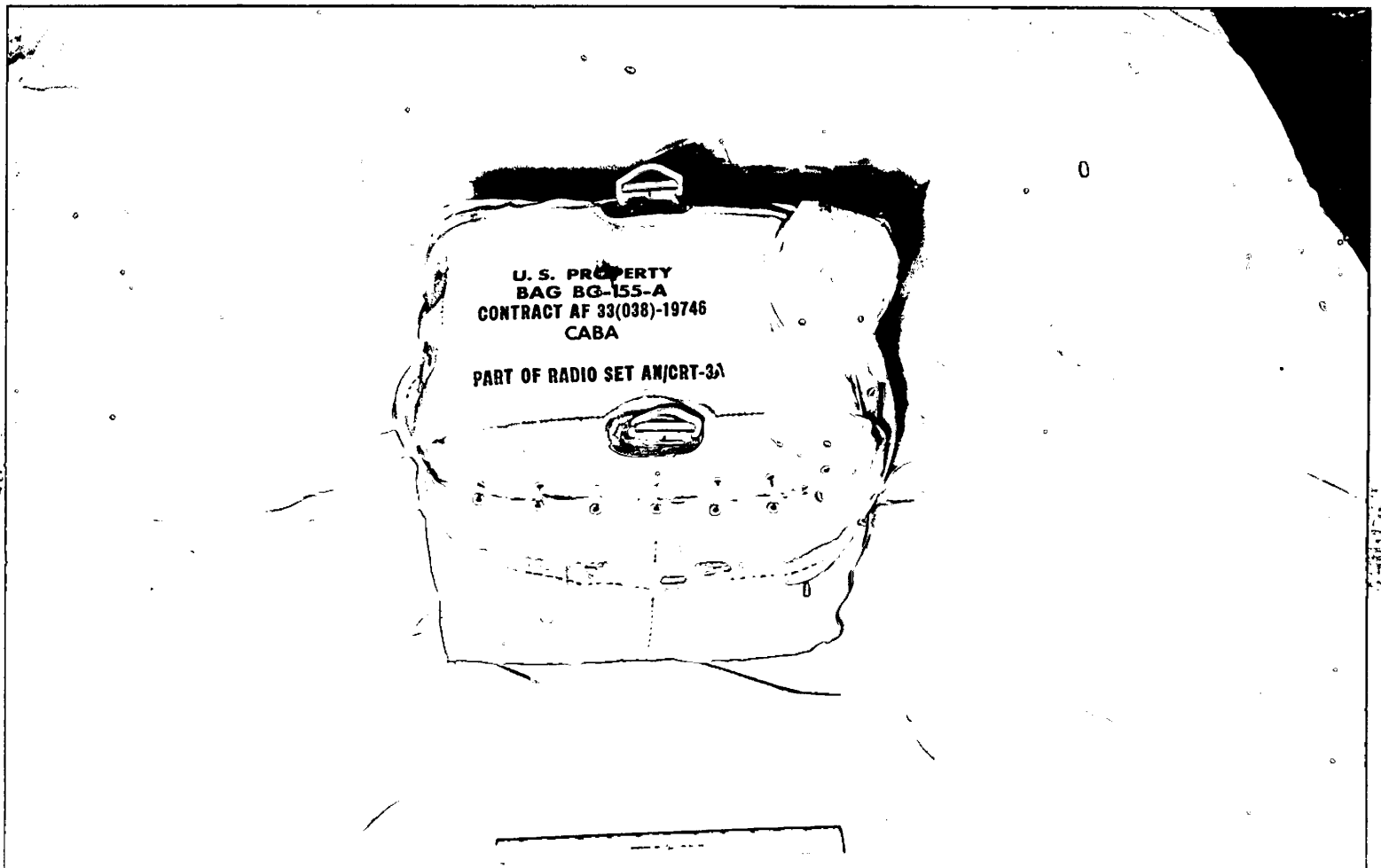

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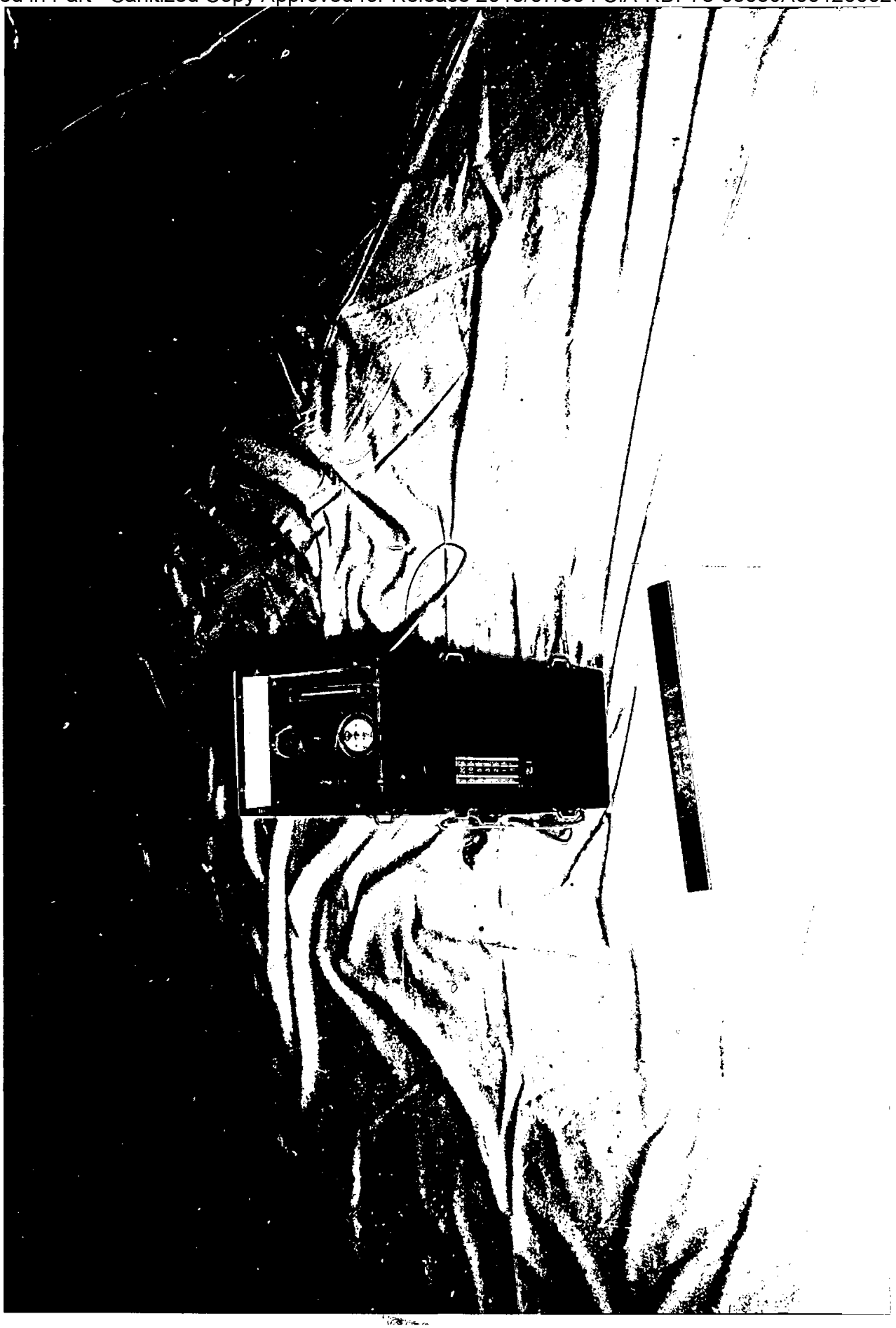

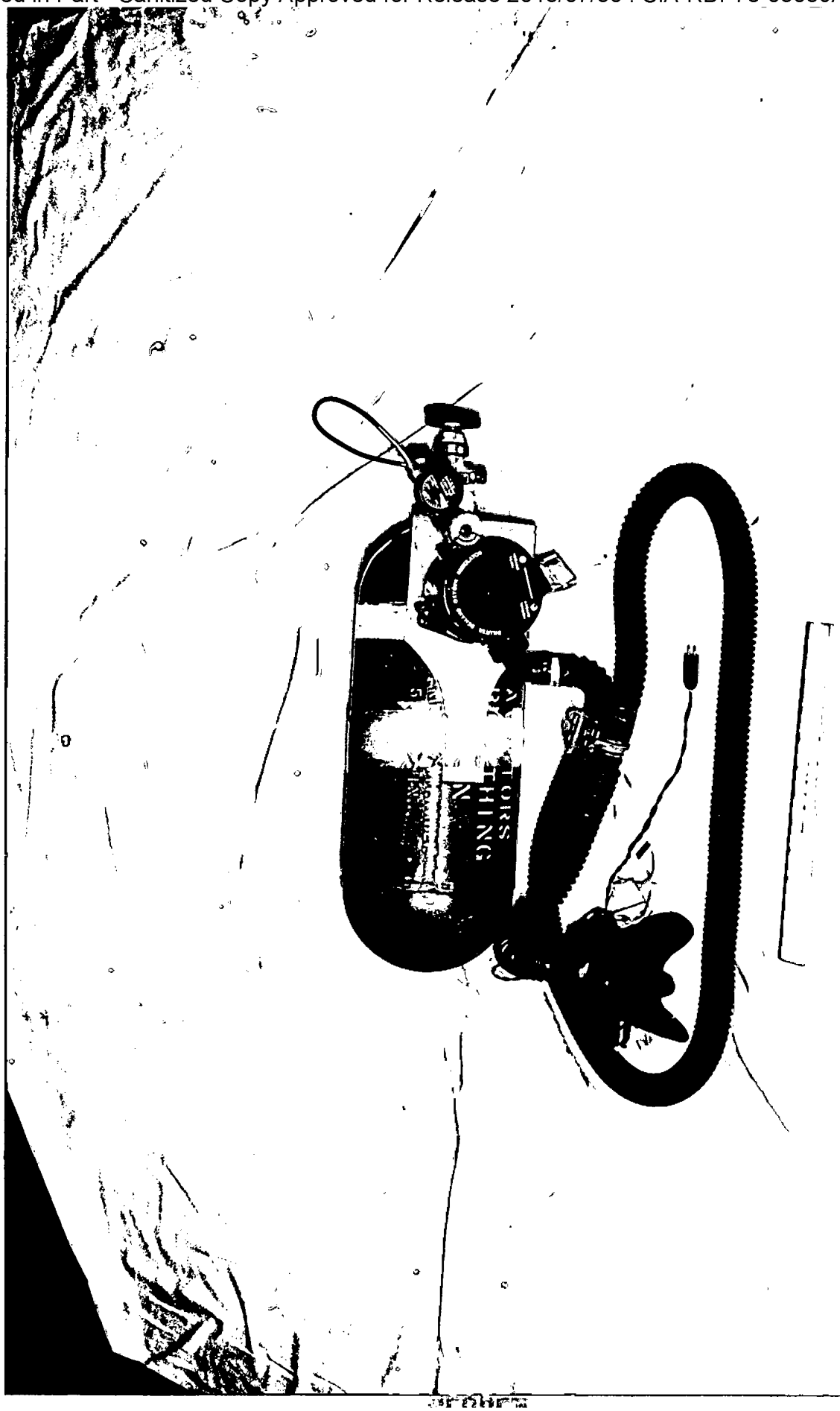

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