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370 History - Hiroshima, etc.

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P. O. Box 1663
Santa Fe, New Mexico
27 September 1945

Brigadier General T. F. Farrell
Box 2610
Washington, 25, D. C.

Dear General Farrell:

I am enclosing a copy of the rough draft of a history of Project A which I prepared in the Marianas.

Although I have had time to make this report factually correct as to dates, etc., it is not completely revised for good readability. I was waiting to do this until Commodore Parsons had had a chance to read and criticize this history. I would appreciate your showing him these chapters in Washington and asking him to send his comments to me.

This report should be profusely illustrated with photographs of which all our best copies (all that show either bomb) are in Washington.

Sincerely yours,

Norman F. Ramsey

NFR:dc

FINAL DETERMINATION
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L. M. Redman
[redacted]
7-17-79

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SPECIAL RE-REVIEW
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[redacted] HISTORY OF PROJECT A

BY

N. F. RAMSEY

FINAL DETERMINATION
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L. M. Redman
JUL 17 1979
EMD Dec 18, 1981

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Chapter I

INTRODUCTION

The history of Project A is essentially the history of the combat use of the ATOMIC BOMB and of the preparation and planning to make this use possible. Project A was responsible for the unification and direction of all activities concerned with the use of a nuclear explosion as a bomb to be delivered to the enemy as opposed to the experimental static firing of such a nuclear explosion on a test site. This responsibility included responsibility for design and procurement of components which were required to convert a nuclear explosion into a combat bomb, coordination with Air Forces activities including the modification of suitable aircraft, supervision of field tests on bombs without active material, planning and establishment of the necessary advance base where the final bombs would be assembled, assembly of active bombs and loading into aircraft, supervision of all tests and actions pertaining to the bomb while aboard the aircraft but prior to release, etc. Many of these responsibilities were shared with other groups and divisions at Project Y, but the basic responsibility for unifying all these activities was that of Project A.

Project A as such was not established until March of 1945. However, the activities later the responsibility of Project A were started long before this time in a different organizational form but with many of the same men in responsible positions. During this earlier period most of what were later defined as Project A problems were known as delivery problems, i.e. problems concerned with the successful delivery of an atomic bomb against the enemy. For this reason a history of Project A should begin with a history of the delivery program at Project Y prior to the establishment of Project A.

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Chapter II

HISTORY OF DELIVERY PROGRAM PRIOR TO THE ESTABLISHMENT OF PROJECT A

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Prior to the establishment of Project A the delivery program was primarily the responsibility of Captain W. S. Parsons, USN, who headed the Ordnance Division at Project Y and N. F. Ramsey in charge of the Delivery Group. These responsibilities were, however, completely shared with Commander Francis Birch who headed the Gun Group, K. T. Bainbridge who up until the establishment of Project A was responsible for the design of the implosion model, R. B. Brode in charge of the Fusing Group, and George Galloway who headed the Engineering Group.

The first major activities of any kind concerned with the delivery program began in June of 1943 when Ramsey at Parsons' request surveyed the Air Forces aircraft to determine approximate sizes, shapes and weights of bombs which could be carried in aircraft. At that time only the gun method of assembly was under consideration and it was thought that a 3000 ft/sec gun would be required to make possible the gun assembly of Pu^{239} so the gun would be 17 feet long. It was apparent as a result of this survey that the only United States aircraft in which such a bomb could be conveniently internally carried was the B-29 and even that plane would require considerable modification so that the bomb could extend into both the front and rear bomb bays by being close under the main wing spar. Except for the British Lancaster, all other aircraft would require such a bomb to be carried externally unless the aircraft were very drastically rebuilt.

On 13 August 1943 the first drop tests of a prototype of an atomic bomb were made at the Dahlgren Naval Proving Ground to determine stability in flight. These tests were on a 1/23 scale model of a bomb shape which was then thought might be suitable for a gun assembly. The model consisted essentially of a long length of 14" pipe welded into the middle of a split standard 500 pound bomb. It was officially known at Dahlgren as the "Sewer Pipe Bomb". For security reasons, Ramsey, who was in charge of these tests, presented himself as a representative of Section T and much of the construction work on the models was conducted at the Applied Physics Laboratory, AT Silver Springs

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The first test on an atomic bomb model at Dahlgren was an ominous and spectacular failure. The bomb fell in a flat spin the like of which had rarely been seen before. However, in subsequent tests an increase in fin area and a forward movement of the c.g. provided stability.

In the months following August further tests of 14/23 scale models of current and ever-changing gun models were made at Dahlgren. The results of these tests were in turn incorporated into the design. Also during this time preliminary models of a proximity fuse which were constructed at the University of Michigan at Brode's request became available. These were extensively tested at Dahlgren beginning on 3 December 1943.

In September of 1943 the fast implosion model was proposed by von Neumann as an alternative to the slow implosion formerly advocated by Seth Neddermeyer. As it became clear that this model was a promising one, preliminary planning for converting it into a bomb were begun. A preliminary estimate of 59 inches diameter and of a nine thousand pound weight was made by von Neumann and Ramsey and on this basis the Bureau of Standards bomb group was asked to design suitable fairing and stabilizing fins for such a bomb.

In the fall of 1943 it became apparent that plans for full scale tests should be started. In view of the critical shortage of B-29's it was at first proposed that a British Lancaster be used for the test work even though a B-29 would almost certainly be used as the combat ship. The Air Forces, however, wisely recommended that a B-29 be use for the test work as well both to avoid non-standard maintenance and to accumulate experience in B-29 operations with such a bomb. In order that the aircraft modifications could begin, two external shapes and weights were selected by Parsons and Ramsey as representative of the current plans at Site Y. One of these was 204 inches long with a maximum diameter of 23 inches and was a model for the current gun assembly. The other was 111 inches long and 59 inches in diameter corresponding to a fast implosion assembly. For security reasons these were called by the Air Forces representatives the "Thin Man" and "Fat Man" respectively - the Air Forces officers tried to make their phone conversations sound as if they were modifying a plane to carry Roosevelt (the Thin Man) and Churchill (The Fat Man)

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Models to these dimensions were ordered from Detroit. Modification of the first B-29 officially began 29 November 1943. Colonel R. C. Wilson was Army Air Forces Project Officer for all aspects of the program, Colonel D. L. Putt at Wright Field was in charge of the division under whose supervision the modification was done, and Captain R. L. Roark was Project Officer in charge of the modification.

Tests with the modified aircraft and full scale dummy bombs were begun at Muroc on 3 March 1944. These tests were participated in by Brode's fusing group, Bainbridge's instrumentation group, and by the delivery group. Coordination of the activities of the different groups in these and subsequent field tests was a responsibility of Ramsey's delivery group. The purpose of the tests ~~were~~ WAS to check the suitability of the fusing equipment, the stability and ballistic characteristics of the bombs, the facilities we then had available for field work, and the suitability of the aircraft to carry and drop the bombs. After four weeks of delay due to torrential rain on the Mojave Desert and due to aircraft troubles, a series of tests were completed. The negative results of most of these tests thoroughly justified the holding of preliminary tests at such an early date. The fuses proved to be unreliable and on the basis of these results an investigation into the possibility of adapting an APS-13 fighter tail warning radar to this use was begun. Although the Thin Man proved to be very stable in its flight, the Fat Man with a tail which the Bureau of Standards bomb group thought would be extremely stable proved to wobble badly with its axis departing 20° from the line of flight. Although the B-29 release mechanism worked satisfactorily for the Fat Man it failed completely for the Thin Man. ~~Four~~ THREE of the units were bad hang ups with the delay being up to 10 seconds and the final drop was 20 minutes premature while the plane was still climbing to altitude. The bomb in this case fell onto the door BOMB BAY which had to be opened to jettison the bomb and which ~~were~~ WAS badly damaged. With this accident the first Muroc tests were brought to an abrupt and spectacular end.

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Between the end of the first tests and June 1944, all groups worked to correct the faults shown to exist in the first tests. Also durin this period it became apparent that Pu^{239} could not be used in a gun due to neutrons of Pu^{240} almost certainly causing a predetonation. Since the length of the gun model was due exclusively to the contemplated use with Pu^{239} it became clear that the gun velocity could for U^{235} be reduced to 1000 ft/sec and the length of the bomb correspondingly reduced so that it could be fitted into a single bomb bay of the B-29, thus simplifying the aircraft installation job. Detailed designing of this model was begun during this period under the supervision of McMillan and Birch. Due to the contrast in dimensions with the Thin Man this model finally acquired the appropriate name of Little Boy. Also during this period the detailed designing of the 1222 form of Fat Man assembly was begun. In this model the high explosive was held together with an inner dural shell consisting of 12 pentagon sections surrounded by an armor steel shell consisting of 20 triangles.

Tests at Muroc were resumed in June of 1944. These tests confirmed the previous results that the first form of fuse being developed at Michigan was not satisfactory. The first two APS-13's became available to the project during the test and two haywire drop tests (genuine baling wire was actually used) were made with a field adaptation of this equipment to fusing. The first of these provided the first completely satisfactory fusing test accomplished and although the second failed it was probable that the failure was in some of the hastily prepared auxiliary equipment. The Fat Man with their tails modified from the original circular shroud to a square shroud 59 inches on a side still had an undamped wobble ~~proved to be unstable~~. As a desperate last resort Ramsey suggested a drop be made with internal 45° baffle plates welded into the inside of the shroud as a field modification. To everyone's surprise this modification was successful with bomb being completely stable in its flight and with the ballistic coefficient being improved rather than decreased as anticipated. No release failures were experienced in the tests.

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Fromthe end of these tests until October 1944 when similar field tests were resumed, a strenuous program of design and procurement was under way at Site Y to obtain units which could be used as components of an actual atomic bomb as opposed to units which were merely ballistic models. Three basically different models were worked on at this time. One was the Little Boy model of the U^{235} gun assembly, one was the 1222 Fat Man model of implosion assembly, and the third was a model which grew into the finally adopted 1561 Fat Man implosion assembly. The latter arose from a redesign for the purposes of simplifying the assembly problem (the assembly of 1222 required the insertion of more than 1500 bolts) and of improving the flight characteristics by using an ellipsoidal shape for the outer armor. It consisted essentially of an inner spherical shell consisting of two polar caps and a segmented centrol zone which could be bolted together and surrounded by an armor ellipsoid to which a stabilizing tail including the necessary drag plates were attached. The auxiliary fusing and electrical detonating equipment was mounted in the space between the inner sphere and outer ellipsoid.

In August of 1943 Colonel R. C. Wilson and Colonel . . Demler visited Site Y and recommended that the Air Forces begin immediately to train a combat unit for the delivery of the Atomic Bomb. Therefore, it was agreed that Site Y should definitely freeze the external shapes of the three models and the other requirements that affected the aircraft by 1 September 1944 so that modification of a production lot of fifteen B-29's could be started. These aircraft were modified at the Martin Nebraska Plant at Omaha and the first aircraft became available in October. Sheldon Dike and Milo Bolstad were the Project Y representatives during these and subsequent modifications. The special modifications for carrying and releasing the bomb were designed to incorporate the British F and G release mechanism as was currently used for the British 12,000 pound bomb. This mechanism required only a single lug on the bomb. At this time Wendover Army Air Base was designated as the center at which training of the new Atomic Bomb Group would be undertaken and at which future field tests would be held. The Second Air Force under General Ent and later under General Williams was designated as the parent

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organization to this group. Colonel Paul Tibbets was designated commanding officer of the combat group (509 Composite Group) and Captain Charles Begg was in command of the 1st Ordnance Squadron, Special. Colonel Clifford J. Heflin was commanding officer at Wendover, Major C. S. Shields was in charge of the Flight Test Section, and Captain Henry Roerkohl was in charge of the Ordnance Test Unit.

The first tests began at Wendover in October 1944. This began a period of tests whi which continued intermittently, then monthly, and finally almost continuously up to August of 1945. Initially the only groups concerned were the Fusing Group, under Brode and Doll and the Delivery Group lead by Ramsey. However as time went on the other groups which participated in the Wendover tests were the Gun Group headed by Birch, the High Explosives Assembly Group headed initially by Bainbridge and later by Bradbury and Warner, the Electrical Detonator Group headed by Fussell, and the Ballistic Group under Shapiro. At the end of November Commander F. L. Ashworth joined the Project and relieved Ramsey of the responsibility of directly supervising the field operations since by then important parts of the Delivery Program of necessity had to be under way concurrently at Wendover and Site Y. In these tests units approaching more and more closely to the final model were tested for ballistics information, for electrical fusing information, for flight tests of electrical detonators, for test of the aircraft release mechanism, for vibration information, for assembly experience, for temperature tests, etc. In addition a number of additional test drops were made at Inyokern (Naval Ordnance Test Station) under the supervision of Charles and Thomas Lauritsen, William Fowler, and Commander Heyward between 20 February of 1945 and August 1945.

From October until the formal establishment of Project A the main activities i n the Delivery Program were a continuation of development, design, production, and test of bombs approaching more and more closely to the final model. During this period the 1222 model was definitely dropped in favor of the 1561 model of Fat Man. Due to poor flying qualities of the first batch of B-29's and to certain weaknesses in the special project modifications a new batch of 15 aircraft were obtained in March and April of 1945. These aircraft had fuel injector engines, electric pitch controlled propellers, very rugged provisions for carrying the bomb and removal of all armament except the tail turret.

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By arrangement with Gen. Norstad, Messrs. F. K. Collbohm and Warren T. Dickinson participated in engineering tests of these modified aircraft. UNCLASSIFIED These aircraft proved to be extremely satisfactory. Colonel R. C. Doubleday was Army Air Forces Project Officer at the time of this last modification. In addition to the Wendover tests during this period numerous physics and engineering tests on complete units were made at V-Site initially under the direction of the Delivery Group and of Bernard Waldman and later after the formation of Project A under Bradbury and Warner. Considerable initial planning for the establishment of an overseas operating base was done during this period.

CHAPTER III

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HISTORY OF PROJECT A AT SITE Y

Project A was formally established in March of 1945. It incorporated many groups also assigned to other divisions and was for the purpose of unifying the activities of those groups as concerned the preparation anddelivery of a combat bomb. Captain W. S. Parsons was Officer in Charge of Project A, N. F. Ramsey was his deputy for scientific and technical matters, Commander F. L. Ashworth was operations officer and military alternate for Captain Parsons, Commander Norris Bradbury and Roger Warner were in charge of Fat Man Assembly, Commander Francis Birch was in charge of Little Boy Assembly, R. B. Brode was in charge of fusing, L. Fussell was in charge of the electrical detonator system, Phillip Morrison and Marshall Holloway were in charge of the pit (active material and tamper), Luis Alvarez and Bernard Waldman were in charge of Airborne observations of the combat explosions, George Galloway was in charge of engineering, Lt. Col. R. W. Lockridge was in charge of supply, Maurice Shapiro was in charge of ballistics and Sheldon Dike was in charge of aircraft problems. In addition the following persons were consultants to Project A: William Penney on damage problems, H. A. Bethe on general theory, and L. Hempelmann on radiological problems. In July as other personnel moved to Tinian, Sam Simmons and Lt. Comdr. T. J. Walker assumed the responsibility for the Wendover tests. The Technical policy committee responsible for initiating technical actions for Project A as recommendations to Capt. Parsons was the Weapons Committee consisting of N. F. Ramsey (Chairman), Comdr. Norris Bradbury (Chairman after Ramsey's departure), Roger Warner, Comdr. F. Birch, R. B. Brode, L. Fussell and Phillip Morrison.

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Project A at Site Y and Wendover was concerned chiefly with three matters: (1) the completion of design, procurement and preliminary assembly of units which would be complete in every way for use with active material, (2) continuation of the Wendover test program to confirm in so far as possible without using active material the adequacy in flight of the components and assembled units, and (3) preparation for overseas operations against the enemy.

In view of the shortness of the available time, the major designs were necessarily continued with as few alterations as possible. The chief design activities during this period were the numerous and urgent ones of supplying the many details necessary for successful operation and of rectifying faults which became apparent in tests. Such matters as the exact design of the tamper sphere, incorporation of features to make a trap door assembly possible, inclusion of a Hypodermic tube between the HE blocks for monitoring purposes, strengthening the Little Boy tail, etc. characterize this period.

This was also the period of maximum activity in tests at Wendover. The unfortunate failure of the Raytheon Company to meet its delivery schedule on X-Units (electrical detonators) added markedly to the difficulty of the test program. This failure reduced the number of tests that were possible on the X-units, prevented efficient testing since many tests had to be repeated twice - once at an early date with all components except an X-unit and once at a critically late date with an X-unit, , and greatly complicated the scheduling of tests since there was no time in which to acquire a backlog of X-units. The tightness of schedule resulting from this is best illustrated by the fact that it was not until the end of July that sufficient X-units had been tested to confirm their safety with HE, the first HE filled fat man with an X-unit was tested at Wendover 4 August, the first HE filled Fat Man with an X-Unit was tested at Tinian 8 August, and the first complete Fat Man with active material was dropped on Nagasaki 9 August. Despite these difficulties, however, a total of 155 test units were dropped at Wendover or the Salton Sea between October and the middle of August 1945. Much information was learned in these tests and incorporated into the design of the units.

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Planning for overseas operations was one of the chief activities of Project A during this period. Initial planning and procurement of some kits of tools, etc. began in December with these activities continuing at an accelerated rate up through July. In February of 1945 Comdr. Ashworth was sent to Tinian to make a preliminary survey of the location and to select a site for our activities. By March the construction needs for the Tinian Base were frozen as the following: Four (4) air conditioned 20' x 48' steel arch rib of the type normally used in the Navy for bomb sight repair (two for the fusing team, one for the electrical detonator team, and one for joint use by the pit team and observation team), three (3) airconditioned 20' x 70' assembly buildings for which the materials were accumulated at Inyokern, five (5) 40' x100' steel arch rib warehouse building, one (1) building of the same basic type as an ordnance administration building, one (1) building of the same type as a modification shop, three (3) 10' x 10' x 5' magazines, seven (7) 20' x 50' x 10' magazines and two (2) special loading pits equipped with hydraulic lifts forloading bombs into the aire craft. A third such pit was constructed at Iwo Jima for possible emergency use. Materials for equipping the buildings and for handling heavy equipment in assembly, tools, scientific instruments, and general supplies were all included in special kits prepared by the different groups. A kit for a central stock room was also started but the materials for the latter were not shipped by August at which time further shipments to Tinian were stopped by the end of the war. Construction of the Tinian base began under the supervision of Colonel E. E. Kirkpatrick in April.

Beginning in May so called batches of kit materials and of components for test and combat units were sent by water borne transportation to Tinian. A total of five batch shipments were made. In addition a number of air shipments in five C-54 aircraft attached to the 509th Group were made for critically needed items. The availability of these C-54's for emergency shipments contributed greatly to the ability of Project A to beat its schedules in combat use of the Atomic Bomb.

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CHAPTER IV

HISTORY OF PROJECT A AT TINIAN

The Project A organization at Tinian consisted of the following: Officer-in-Charge, Commodore W. S. Parsons; Scientific and Technical Deputy to Officer-in-Charge, N. F. Ramsey; Operations Officer and Military Alternate to Officer-in-Charge, Comdr. F. L. Ashworth; Fat Man Assembly Team headed by Roger Warner; Little Boy Assembly Team headed by Comdr. Francis Birch; Fusing Team headed by E. B. Doll; Electrical Detonator Team headed by Lt. Comdr. E. Stevenson; Pit Team headed by Phillip Morrison and C. P. Baker; Observation Team headed by Luis Alvarez and Bernard Waldman; Aircraft Ordnance Team headed by Sheldon Dike; and Special Consultants consisting of Robert Serber, W. G. Penney and Captain J. F. Nolan. The team leaders formed a Project Technical Committee under the chairmanship of Ramsey to coordinate technical matters and to recommend technical actions to Captain Parsons. The following persons were team members: Harold Agnew, Ensign D. L. Anderson, T/5 B. Bederson, Milo Bolstad, T/Sgt. Raymond Brin, T/Sgt V. Caleca, M. Camac, T/Sgt E. Carlson, T/4 A. Collins, T/Sgt R. Dawson, T/Sgt F. Fortine, T/3 W. Goodman, T/ D. Harms, Lt. J. D. Hopper, T/Sgt J. Kupferberg, L. Johnston, L. Langer, T/Sgt. W. Larkin, H. Linschitz, A. Machen, Ens. D. Mastick, T/3 R. Matthews, Lt. (jg) V. Mill r, T/3 L. Motechko, T/Sgt. W. Murphy, T/Sgt E. Nooker, T. Olmstead, Ens. B. O'Keefe, T. Perlamn, Ens. W. Prohs, Ens. G. Reynolds, H. Russ, R. Schreiber, T/Sgt. G. Thornton, Ens. Tucker, and T/4 F. Zimmerli. Although not strictly a part of Project A, the following were closely associated with the work of Project A; Rear Admiral W. R. Purnell representative of the Atomic Bomb Military Policy Committee; Brig. Gen. T. F. Farrell representative of Major Gen. L. R. Groves; Colonel E. E. Kirkpatrick, alternate to Gen. Farrell and officer in charge of construction; Colonel P. W. Tibbets, commanding officer of the 509th Composite Group; Lt. Col. Peer de Silva, commanding officer of the 1st Technical Service Detachment, which served as administrative, security and housing organization for Project A; and Major Charles Begg, commanding officer of the First Ordnance Squadron, Special.

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Although preliminary construction at Tinian began in April of 1945, intense technical activities, however, did not begin until July. The first half of July was occupied in establishing and installing all of the technical facilities needed for assembly and test work at Tinian. After completion of these technical preparations, a little boy unit was assembled and on 23 July the Tinian base became fully operational for little boy tests with the dropping of unit L1. In this test the dummy little boy was fired in the air by the radar fuse. In this as in subsequent Tinian tests excellent results were obtained. The second little boy, Unit L2, was dropped 24 July, and a third, Unit L5, on 25 July. The only remaining little boy included as part of the test for a check of facilities at Iwo Jima for emergency reloading of the bomb into another aircraft. Since the Iwo facilities were not ready until 29 July this test was postponed until then. On 29 July a completely successful test of the Iwo facilities was completed. The plane landed with this unit, L6, at Tinian so that it could be used in the final rehearsal maneuvers. On 31 July the plane with L6 took off accompanied by the two observation planes. The planes flew to Iwo where a rendezvous was made and then returned to Tinian where the bomb was dropped and observed to function properly. After the release of the bomb all three aircraft rehearsed the turning maneuvers which would be used in combat. With the completion of this test all tests preliminary to combat delivery a little boy with active material were completed.

The first fat man test, unit F13, was made on 1 August. This unit used cast plaster blocks, electronic fusing, eight electric detonators, Raytheon detonating unit and informers and smoke puffs on the operation of the detonators. The test showed that all essential components of the bomb functioned satisfactorily. A second inert fat man, F18, similar to F13 was prepared and loaded into a B-29 for drop on 3 August. However, due to the lack of information at Tinian of the results of the Kingman tests on the adequacy of the venting in the sealed fat man, this unit was unloaded and the barometric switches modified so that this information would be obtained on unit F18. In this modified form it was dropped on 5 August. All components functioned satisfactorily and the venting was adequate for the internal pressure to close a barometric switch set for 17,000 feet pressure altitude 17 seconds before impact. The only

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remaining preliminary fat man test was unit F33, a replica of the active unit except for the lack of active material and the use of lower quality high explosive lens castings. The components for this unit arrived at Tinian at 1230 on 2 August and preliminary assembly began the same day. Although this unit was fully prepared by 5 August, it was not dropped until 8 August due to absence of key crews and aircraft on the hot little boy mission. The mission was then conducted as a final rehearsal for the delivery of the first live fat man. Both the rehearsal operation and the detonation of the unit were completely satisfactory.

On 26 July the U^{235} projectile for the little boy was delivered by the cruiser Indiannapolis. The U^{235} target insert arrived in three separate parts in three otherwise empty Air Transport Command C-54's during the evening of 28 to 29 July. All three had arrived by 0200 29 July. Since the earliest date previously discussed for combat delivery of the fat man was 5 August (at one time the official date was 15 August), Parsons and Ramsey cabled General Groves for permission to drop the first active unit perhaps as early as 1 August, with 2 August being more probable since the weather was forecast to be bad on 1 August.

Although the active unit, No. L11 was completely ready in plenty of time for a 2 August delivery, the weather was not. The first, second, third, and fourth of August were spent in impatient waiting for good weather. Finally on the morning of 5 August we received word that the weather should be good on 6 August. At 1400 on 5 August General Lemay officially confirmed that the mission would take place on 6 August.

The little boy was loaded onto its transporting trailer at 1400 5 August and with an accompanying battery of official photographers under 9-2 Supervision was taken to the loading pit. The B-29 was backed over the pit at 1500 and the unit was loaded shortly thereafter. The aircraft was then taxied to its hard stand where final testing of the unit was completed. By 1800 all was ready. Between then and take off the aircraft was under continuous watch both from a military guard and from representatives of the key technical groups,

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Final briefing was at 0000 of 6 August. Following this and an early breakfast the crews assembled at their aircraft. There amid brilliant floodlights their pictures were taken and retaken by still and motion picture photographers as if for a Hollywood premier. For this mission Col. P. W. Tibbets was pilot of the B-29, named the Enola Gay which carried the bomb, Major Thomas Ferebee was bombardier, Captain W. S. Parsons was bomb commander, and Lt. Morris Jepson was electronics test officer for the bomb. L. Alvarez Bernard Waldman, Harold Agnew and Larry Johnston rode in the accompanying observation aircraft.

The progress of the mission is best described in the log which Capt. Parsons kept during the flight:

6 August 1945

0245 Take off

0300 Started final loading of gun

0315 Finished loading

0605 Headed for Empire from Iwo

0730 Red plugs in (these plugs armed the bomb so it would detonate if released)

0741 Started climb

Weather report received that weather over primary and tertiary targets was good but not over secondary target.

0838 Leveled off at 32,700 feet

0847 All Archies (electronic fuses) tested to be O.K.

0904 Course west

0909 Target (Hiroshima) in sight

0915½ Dropped bomb (Originally scheduled time was 0915)

Flash followed by two slaps on plane. Huge cloud

1000 Still in sight of cloud which must be over 40,000 feet high

1003 Fighter reported

1041 Lost sight of cloud 363 miles from Hiroshima with the aircraft being 26,000 feet high

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The crews of the strike and observation aircraft reported that 5 minutes after release a low 3 mile diameter dark grey cloud hung over the center of Hiroshime, out of the center of this a white column of smoke rose to a height of 35,000 feet with the top of the cloud being considerably enlarged.

Four hours after the strike photo-reconnaissance planes found that most of the city of Hiroshima was still obscured by the cloud created by the explosion although fires could be seen around the edges. However, the following day excellent pictures were obtained which showed the tremendous magnitude of the power of a single atomic bomb, which completely destroyed 60 percent of the city of Hiroshima.

The first fat man with active material, unit F31, was originally scheduled for dropping on 11 August local time (at one time the schedule called for 20 August). However, by 7 August it became apparent that the schedule could be advanced to 10 August. When Parsons and Ramsey proposed this change to Tibbets he expressed regret that the schedule could not be advanced two days instead of only one since good weather was forecast for 9 August and the five succeeding days were expected to be bad. It was finally agreed that Project A would try to be ready for 9 August provided it was understood by all concerned that the advancement of the date by two full days introduced a large measure of uncertainty into the probability of our meeting such a drastically revised schedule. However, all went well with the assembly and by 2200 of 8 August the unit was loaded and fully checked.

The strike plane and two observing planes took off at 0347 local time on 9 August. Major C. W. Sweeney was pilot of the strike ship, Capt. K. K. Beahan was bombardier, Comdr. F. L. Ashworth was bomb commander, and Lt. Philip Barnes was electronics test officer. This mission was as eventful as the Hiroshima mission was operationally routine.

Due to bad weather between Tinian and Iwo Jima a preliminary rendezvous was not planne for the three aircraft at Iwo Jima and instead the briefed route to the empire was from Tinian direct to Yakoshima on Kyushu. The briefed ~~xxxx~~ cruising altitude was 17,000 feet. Commander Ashworth's log for the trip is as follows:

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0347 Take off

0400 Changed green plugs to red prior to pressurizing

0500 Charged detonator condensers to test leakage. Satisfactory

0915 ~~0900~~ Arrived rendezvous point at Yakashima and circled awaiting accompanying aircraft

0920 One B-29 sighted and joined in formation

0950 Departed from Yakashima proceeding to primary target Kokura having failed to rendezvous with second B-29. The weather reports received by radio indicated good weather at Kokura (3/10 low clouds, no intermediate or high clouds, and forecast of improving conditions) The weather reports for Nagasaki were good but increasing cloudiness was forecast. For this reason the primary target was selected.

1044 Arrived initial point and started bombing run on target. Target was obscured by heavy ground haze and smoke. Two additional runs were made hoping that the target might be picked up after closer observation. However at no time was the aiming point seen. It was then decided to proceed to Nagasaki after approximately 45 minutes had been spent in the target area.

1150 Arrived in Nagasaki target area. Approach to target was entirely by radar. At 1158 the bomb was dropped after a twenty second visual bombing run. The bomb functioned normally in all respects.

1205 Departed for Okinawa after having circled smoke column. Lack of available gasoline caused by an in-operative bomb bay tank booster pump forced decision to land at Okinawa before returning to Tinian

1351 Landed at Yontan Field, Okinawa

1706 Departed Okinawa for Tinian

2245 Landed at Tinian

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Due to bad weather, good photo reconnaissance pictures were not obtained until almost a week after the Nagasaki mission. These showed that the bomb detonated somewaht north of the Mitsubishi Steel and Arms Works. All other factories and buildings on the Urakami River from the Nakajima Gawa River through the Mitsubishi Urakami Ordnance Plant were destroyed. The distance from the northernmost factory that was destroyed to the southern boundary of complete destruction was about three miles and damage might have occurred north of the Urakami Ordnance Plant if any buildings had been there. Although only 44 percent of the city was destroyed by the official record, this was due to the unfavorable shape of the city and not to the location of the bomb detonation.

On the day following the Nagasaki mission, the Japanese initiated surrender negotiations. Consequently further activity in preparing active units was suspended. However, the entire project was maintained in a state of complete readiness for further assemblies in the event of a failure in the peace negotiations. For the first week following the Nagasaki mission the test program at Tinian was continued and three dummy fat man units, Nos. F101, F102, and F103 were prepared. They were not dropped, however, since the Japanese had stated their willingness to accept the American terms prior to the date scheduled for the drop. Originally it was planned to return all Project A technical personnel to the United States on 20 August except for those assigned to the Farrell Mission for investigating the results of the atomic bombing of Japan. However, on 18 August a message was received from General Groves stating that in view of the then current delays in the surrender procedures all key Project A personnel should remain at Tinian until the success of the occupation of Japan was assured. The scientific and technical personnel finally received authorization for return to the United States on 5 September and departed from Tinian on 7 September 1945. With this departure the activities of Project A were effectively terminated although Col. Kirkpatrick and Comdr. Ashworth remained behind at Tinian for final disposition of Project A property.

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CHAPTER V

CONCLUSION

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Project A, after a long period of preparation in the United States, had a very short but highly intense and successful period of activity overseas. The shortness of the intense period of its overseas activities are best summarized by the attached figure one which shows the activity of Project A as measured by its number of transmitted dispatches plotted as a function of the date.

As in all urgently expedited development projects for which there are no precedents, many mistakes were made in Project A. With the benefit of the experience accumulated by Project A it would subsequently be possible to replan its activities to accomplish its objective both with greater economy and with improved designs. However, despite the novelty of the weapon and the lack of precedent for most of its problems, Project A did successfully accomplish all of its major objectives and did so on or ahead of time.

The object of Project A was to assure the successful combat use of an atomic bomb at the earliest possible date after a field test of an atomic explosion and after the availability of the necessary nuclear material. This object was very effectively accomplished. The first combat bomb was ready for use against the enemy within seventeen days after the first experimental nuclear explosion at Alamogordo and almost all of the intervening time was spent in accumulating additional active material for making an additional bomb. The first atomic bomb was prepared for combat use against the enemy on 2 August within four days of the time of the delivery of all of the active material needed for that bomb. Actual combat use was delayed until 6 August only by bad weather over Japan. The second atomic bomb was used in combat only three days after the first despite its being a completely different model and one much more difficult to assemble. The success of the combat use of the atomic bomb is best summarized by the fact that Japan began surrender negotiations four days after the use of the first atomic bomb.

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ILLUSTRATIONS

(This history should be liberally illustrated with photographs. Unfortunately all prints showing any part of either bomb are in Washington and consequently no selections could be made from these. Of the pictures available at Site Y, the following should be included in the histroy (the numbers refer to the numbers on prints supplied by the 509th Composite Group Photo Lab): Numbers 57, 58, 91, 138, 14, 5, a photo on which the number cannot be distinguished of Tibbets receiving air medal, a photo of scientific group of which I am enclosing a copy since I am not sure copies are available in Washington, smoke above Hiroshima, smoke above Nagasaki, damage to Hiroshima and damage to Nagasaki).

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