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~~DEVELOPMENT OF~~ NIGHT AIR OPERATIONS

1941-1952

U.S. Historical Division
Air University, U.S. Air Force

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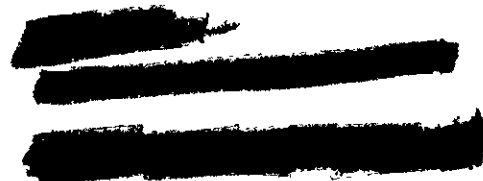
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FOREWORD

This monograph covers the development of United States ^{Air} Force night operations through World War II in detail. It gives brief treatment to the period between wars, and treats of night air operations in Korea through 30 June 1952. This study was written by Joe Gray Taylor, Assistant Professor of Social Sciences, Francis T. Nicholls Junior College.

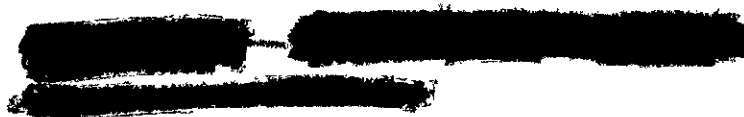
Like other Historical Division studies, this history is subject to revision, and additional information or suggested corrections will be welcomed.

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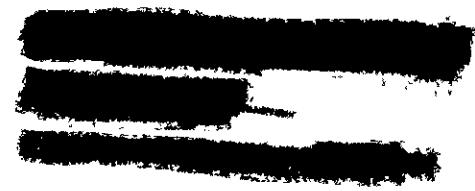
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I. INTRODUCTION

The United States Army Air Force was unprepared in many respects when this country entered the Second World War, but in few respects was it so unready as for night air operations. Air-power in general was the subject of much public interest during the period between the two World Wars, and this interest was accentuated by the activities of General Mitchell and other able publicists. But although a great many people avidly read newspaper and magazine accounts of fast interceptors, the gigantic B-19 bomber, and "pickle barrel bombsights," the Air Force fared no better than the rest of the armed forces in obtaining appropriations.

Those who directed the fortunes of the air arm wisely devoted a large part of such appropriations as were obtained to research and engineering. Indirectly this was to have important effects upon night flying in combat, but a very small part of this research was directly concerned with solving the problems of night operations in wartime. The beginning of hostilities in Europe revealed that little theory and almost no planning data were available in this country for application to night air offense or defense.

^{This}
~~Which~~ is not to say that nothing at all had been done in ~~the line~~ of night flying experimentation. Indeed, the Martin MB, "the standard heavy bomber of the Air Force in the years that followed World War I,

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was considered a night bomber." During the early 1920's, according to General Arnold, ^{Lieutenant} Clayton Bissell utilized new instruments "that made night flying as safe as day flying" and began "a series of night cross-country flights from Bolling Field to Langley Field." From 1931 through 1933 the "little fighter and bomber units" of the ^{Air Corps} ~~Air Force~~ "concentrated on night missions and altitude flying. Actually the crews found it was easier to fly at night than in the daytime." Even the air-mail fiasco of 1934 "gave us wonderful experience for combat flying, night flying; but, best of all, it made it possible for us to get the latest navigational and night-flying instruments in our planes."¹

Indeed, it was only in the years immediately preceding the outbreak of World War II that ^{AAF} ~~Air Force~~ opinion hardened on the subject of day bombing almost to the exclusion of night operations. In the late 1920's ~~Air Force~~ planners recommended the use of two types of bombing plane: One was to be fast and heavily armed, with short range and light bomb load, for use as a day bomber; The second ~~type~~ was to have less armament, but it was to carry a heavier bomb load for a greater distance at night. The War Department objected to this plan, and insisted that all effort be concentrated on an all-purpose bomber. It was in the discussion which followed this decision that the ^{Air Corps} ~~Air Force~~ first began arguing the advantages of "a specially designed day bomber."²

There were a few significant tactical exercises in night flying in the years preceding ^{the} United States' entry into the war. An experiment

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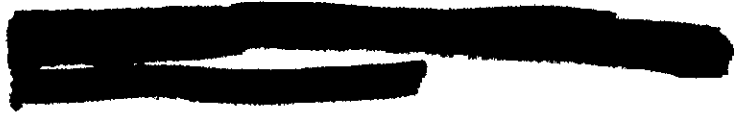
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in strafing surface targets at night was carried on off the coast of California in October 1937. When the targets to be fired upon were illuminated by searchlights, fighter pilots were easily able to locate and hit them, but illumination by flares proved disappointing. It was found that the flares burned out too quickly and drifted with the wind, difficulties which were to plague night attacks against precision targets during the war. Pilots also complained that changes in the intensity of flare lighting were another obstacle in the way of locating the targets. No pilot succeeded in finding a flare-illuminated target in this test.³ In view of the date of this exercise it is interesting to note that a similar experiment, except that the target was a motor convoy, was carried out in England in 1944. It was decided in the latter case that flares gave enough light for attacks on motor convoys from medium or low altitude, but again failure (to properly) allow for wind drift resulted in poor illumination.⁴ The use of flares for attacks on pinpoint targets was to prove unsuccessful in the main during World War II, but was finally to come into its own in the Korean War.

A perhaps more important experiment was¹ made at Fort MacArthur, California, in June 1937. This was an attempt to use searchlights and fighters in conjunction as a defense against bombers attacking at night. A like exercise was conducted in Hawaii in 1940.⁵ These tests aided in the development of fighter-searchlight teams, even though the audio-directed searchlights used in the tests were not so efficient as the radar-

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guided beams available during the war. It was fortunate that the tests were held, because fighter-searchlight cooperation was the only effective airborne defense against Japanese night attacks during the early days of the Pacific War.

Even so, it may safely be said that the United States Army Air ^{Corps} Force was almost wholly unprepared for night operations when war broke out in Europe, ^{in 1939.} The relative handful of trained pilots available had some experience in night cross-country flying, but little or nothing had been done to prepare them for bombing or defense against bombing during the hours of darkness. Navigators lacked experience in finding positions at night without navigational aids. Bombardiers had practiced bombing lighted targets at night, but pathfinding technique was still in the future. Radar was already thought of as a warning device, but its use for air interception and target location was hardly considered. Last, but by no means least, no American planes had been designed or specially equipped for night operations.

The course of the first two years of war in Europe made it clear that night operations were an important aspect of air power. The British soon discovered that their medium and heavy bombers could not operate over Europe in daylight, and as a result concentrated upon night bombing. ^{The German success in} Norway demonstrated the effectiveness of air power in general as a factor in warfare, and the rapid fall of France added emphasis. Then came the Battle of Britain.



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When the Spitfire fighter, used in conjunction with early warning radar, had turned back Germany's daylight air assault on Great Britain, the Luftwaffe turned to night bombing. The cities of England were gravely damaged, but here too counter^{measures} came in time. Radar sets, called AI (for air interception), were installed first in Blenheims, then in Beaufighters when these new and better aircraft became available. These radar-equipped interceptors, cooperating with a ground radar station ~~which was~~ designated GCI (for ground control interception), inflicted serious losses on the attacking bombers. "It was with relief that the German Air Force received their orders in May to break off the night attacks on Great Britain and to prepare for action in another theatre."⁶ Moreover the Germans, using planes which were intended primarily for daylight operations and lacking the weight and coordination of attack that the later years of the war were to witness, had shown the Royal Air Force how to avoid many pitfalls when it was ready to go over to the offensive.

It was during the night attacks on British cities that another technique of aerial warfare was developed. RAF crews, often flying the converted American A-20 attack bomber known in England as the "Boston," sometimes flew into France and lurked near the German landing grounds. Often they succeeded in shooting down some of the returning bombers in the landing pattern. Indeed, these "intruders," as they came to be called,

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sometimes managed even to shoot down training planes.⁷ Intrusion came to play a more and more important part in aerial warfare as time went on.

However much England suffered from the German night attacks, the experience she gained was of incalculable value to her ally, the United States. Because all this experience was made available to American authorities, the technique for defense against night attacks was known to the ^{Air}~~Air Force~~ by the time the Japanese struck at Pearl Harbor. It was lack of equipment and tactical experience, not lack of knowledge, that made American troops vulnerable to night harassing attacks during the early stages of the war. The techniques of night bombing were not so far advanced, but the British had gained some experience, and it was possible to profit from German mistakes. The tactics of intrusion against enemy airfields were well advanced, and no great change would be necessary when such attacks were turned against lines of communication. Furthermore, to satisfy British requirements, a night fighter was already in production in America. The P-70, as this modified Douglas A-20 was designated ~~by the Air Force,~~ proved to be a highly unsatisfactory night interceptor, but it was far better than nothing.

This monograph is concerned with the night combat operations of the ^{AAF}~~United States Air Force~~ during and since World War II. The term "combat operations" is construed narrowly, so as to exclude troop carrier operations.



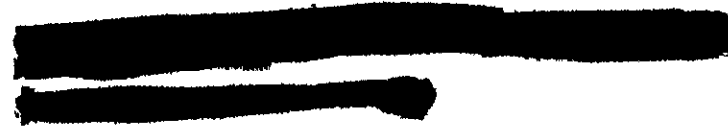


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Nor is night reconnaissance considered, except as it was incidental to other combat activities. Hence, insofar as World War II is concerned, attention will be given to night fighters, night bombing, and intruder operations. Night attacks against the Japanese homeland by the B-29's of the Twentieth Air Force will be considered separately, because they were the culmination of American night bombing effort. Brief consideration will be given to pertinent developments after World War II, and the night air operations in the Korean War will be discussed. The last chapter of the monograph will be a short evaluation of the operations already discussed.





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II. NIGHT FIGHTERS IN WORLD WAR II

Tactics, training, and planes. Before Pearl Harbor the ^{AAF} ~~Air Force~~ had made as few preparations for night fighter defense as for other phases of night operations. Fortunately, there was little need for this type of aircraft during the early months after the United States entered World War II.

100-10
~~There was little need for night fighters in the Pacific before Guadalcanal because~~ the Japanese Air Force enjoyed such a measure of superiority that it could operate in daylight with little fear of excessive loss. Not until the Coral Sea, Midway, and Guadalcanal had blunted the enemy air effort did night raids become a serious problem in the Pacific. Even then suitable radar-equipped night fighters were not available, and it was not until mid-1944 that American night fighters could contribute to checking Japanese night attacks.

In Europe American night fighters were not needed until after the invasion of North Africa in November 1942. Prior to this time the Luftwaffe had mounted its ~~great~~ night raids on Great Britain, but no American bases had been exposed to attack, ^{and it was - Britishers - responsible for the U.S. bases.} ~~It was necessary to depend on British planes and crews for night fighter defense in North Africa; and~~ when American units began operating in the Mediterranean, they flew British Beaufighter aircraft.

100-10
Night fighter tactics had been developed by the British during the Battle of Britain, ~~and they~~ remained very much the same throughout the





war. In order to be successful, night fighter operations had to depend upon complicated equipment, but the actual tactics were not complicated. However, when the equipment operated erratically, or when the men handling the equipment became careless or inefficient, night fighting could become a very confused operation.

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Night fighter tactics assumed, correctly in most cases, that oncoming bombers would be detected by early warning radar some time before reaching their target. If the terrain was such that warning could be received soon enough, night fighters might be scrambled, that is sent up from the ground in time to intercept. When warning early enough to permit a scramble was unlikely, or if hostile activity was definitely expected, one or two airborne fighters might be kept aloft throughout the night. As soon as the attacking force was detected, the planes on patrol could be alerted, and if enough time was available, other night fighters could be scrambled.¹

As soon as the enemy force was within its range, GCI took over control of the defending night fighter. GCI was a radar device which used a cathode ray tube on which a map of the terrain within its range had been superimposed. This cathode ray tube, designated PPI (Plan Position Indicator), revealed all aircraft within its range as "blips," that is, little spots of light.² The GCI operator, known as the controller, knew by the position of the blips and also by IFF (Interrogator, Friend or Foe) which plane was the fighter he was maneuvering. IFF was a



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highly secret transmitting device, carried aboard the airplane, which caused a predetermined signal to appear on a radar screen, ~~it had been used by the RAF early in the war.~~ The controller communicated with the pilot of the night fighter by means of VHF (Very High Frequency) radio, which was also a British ~~contribution.~~ When an enemy plane or planes appeared on his PPI scope, the GCI controller could "vector" the night fighter toward the approaching enemy. ~~This involved~~ giving the fighter pilot a series of compass headings which would bring him into the vicinity of the approaching bomber. Also, of course, it was necessary for the controller to direct the night fighter pilot to gain or lose altitude so as to reach the same level as the raider.

Since he had blips representing each airplane on his PPI scope, the controller could make corrections as needed to bring the fighter into range of its quarry, even though the attacking bomber might change course and altitude. If possible, the fighter was put into position a few miles behind the raider on the same heading. At this point the short-range AI (Air Interception) radar set aboard the night fighter was usually able to pick up the "bogey," as enemy planes were commonly designated.

Up to this point the night fighter pilot had been directed by the ground controller, but when good AI contact was established, the radar operator (RO) aboard the night fighter, ~~usually referred to simply as the RO,~~ took over control. He directed ~~course and altitude changes, and changes in~~ speed, so as to bring the night fighter in behind the bogey. Ideally, the night

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fighter gained slowly in order that the bogey could be identified and attacked before the fighter overran it. Usually, after good AI contact had been established, the RO directed his pilot to reduce speed until the speed of the raider had been established. Then the fighter's speed was increased to ^{about} a rate 40 miles per hour ~~or so~~ faster than ~~the speed~~ ~~of~~ the bomber; this rate of closure was gradually reduced as the night fighter neared its target.

When about 3,500 feet away from the bomber, the RO not only continued to track the enemy with his radar scope, but also told the pilot where to look. For instance, he might tell the pilot to look 10° left, 25° above, and 3,000 feet ahead. Or he might simply say 3,000 feet ahead at 11 o'clock high. Sooner or later, as the fighter drew nearer the bomber, the pilot of the night fighter was expected to make visual contact. ~~In other words, he was to see his quarry.~~

^{A2}
So soon as he caught sight of the raider, the night fighter pilot assumed responsibility. He had to be certain that the bogey was not a friendly plane whose pilot had failed to turn on the IFF, or which had suffered damage to its recognition equipment. Therefore positive identification was necessary. The attack approach might be made directly from the rear or, if it had been necessary to silhouette the bogey against the sky in order to make identification, from below. When flying over an undercast, the night fighter might be forced to make its attack from above, and when the bogey carried backward-looking radar, the night fighter drew abreast for identification and then came in from below and astern.³

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These were general tactics, but an actual night fighter interception was carried out in a few minutes of intense action, and no two interceptions were ever exactly alike. Pilots and radar operators, assisted by GCI controllers, worked together as teams and developed variations of their own. Evasive action by the bogey added more variables to the interception equation. As early as June 1943 an observer reported that because of evasive action by German bombers, nearly all night fighter attacks in Europe involved deflection shooting. It was recommended that this be emphasized in the gunnery training of night fighter pilots.⁴

As a rule, all radar interceptions at night involved GCI control until AI contact was established, then visual contact, identification, and firing on the enemy plane. Sometimes, however, GCI simply directed the night fighter into the stream of bombers during a heavy attack, depending upon AI to pick up individual targets. Sometimes, too, night fighters "free lanced," lurking in wait without GCI assistance in an area where enemy activity was expected.⁵

The training of American night fighter squadrons began early in the war, and refinements were added as combat experience was gained. Even so, few changes from the procedures already developed by the British were ever made.⁶ The 481st Night Fighter Operational Training Group was activated 15 July 1943. Under this group the 348th and 349th Night Fighter Squadrons trained crews in the basic skills of night fighter operation. The 420th Night Fighter Squadron, which had been activated





28 May 1943, administered advanced night fighter training. Training activities were carried on in Florida until December 1943; thereafter Hamner Field, in California, was the training center.⁷

Training for aircrews was divided into two phases. During the first phase ground school studies included familiarization with the P-70 and, later, the P-61, maintenance and engineering, communications, air defense, and radar. Courses in combat hygiene, intelligence, day and night operations, weather, and aircraft recognition rounded out the first phase ground school, except for 30 hours of drill and physical training. Day and night transition, including landings and takeoffs, high-altitude flying, day and night navigation, formation flying, and search-light training missions used up about one-fourth of the 200 hours flying time in this phase. The remaining hours were devoted to basic and advanced instrument flying.

Ground school included 20 hours of actual assistance in maintenance work in the second phase, and also gunnery theory and instruction in the duties of squadron officers. Flying training in this phase included 15 daylight AI interceptions, ¹⁰ ~~ten~~ night AI interceptions, and ¹⁰ ~~ten~~ GCI interceptions. In addition, instrument flying, navigation, and simulating enemy planes was included in the second phase.⁸

Those night fighter units which were first assigned to the European Theater of Operations received further training abroad. ~~These units were~~ destined for the Mediterranean, ~~but~~ aircrew and maintenance personnel



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went first to England, where they were given instruction in operating and maintaining the Beaufighter, the British night fighter which had turned back the Luftwaffe during ~~the second phase of~~ the Battle of Britain. The training in England included some tactical instruction.⁹

~~It was necessary that~~ these American units ^{use} British equipment because the P-70, the only American night fighter available, was suited only for intruder work. This fighter, a converted A-20 attack bomber, was adequately armed, but was deficient in many other respects. The radar with which the plane was originally equipped, SCR-540, had a forward range equal to altitude, ^{hence} not more than five miles, ^a vertical range 3,000 feet below or above that altitude, and a lateral range slightly less than the vertical. It was reported from Guadalcanal that the P-70 required 45 minutes to reach a service ceiling of 22,000 feet, that Japanese medium bombers easily outran it at that altitude, and that the enemy bombers almost always came in higher than that anyway. Later models of the P-70 were equipped with SCR-720 radar, which had considerably more range than its predecessor, but the performance of the airplane was still so unsatisfactory that by August 1944 only 12 were still on combat operations. These 12 were used almost entirely for intruder work.¹⁰

Eventually the production of P-61 night fighters reached such proportions as to permit the use of this plane in combat. The Black Widow, as the twin-boomed interceptor was called, was greatly superior to the P-70.

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Its two 2,000-horsepower Pratt ^{and} Whitney engines enabled it to climb from sea level to 25,000 feet at a mean rate of 1,775 feet per minute, and gave it a true air^{speed} of 367 miles per hour at 20,000 feet. Superior as this performance was to that of the P-70, it was considered somewhat poor for the interception of Japanese bombers above 20,000 feet. Indeed, Marine night fighters had to be brought into Leyte when P-61's proved unable to check Japanese night attacks.¹¹

In Europe the merits of the P-61 were an academic question until after the Normandy landings. ^{Lt.} General Lewis H. Brereton, commander of the Ninth Air Force, saw his first Black Widow in April 1944. Two squadrons, the 422nd and the 425th, used the new interceptor during the drive across France. In the Mediterranean it was December 1944 before the 414th Squadron received its first P-61's and a month more before they were put into combat. The 417th Squadron did not begin converting to P-61's until March 1945, and the 416th Squadron had actually converted to and become operational in British Mosquitoes before it received P-61's just as the war was ending.¹²

At first glance, the seeming neglect of night fighter defense implicit in these facts is difficult to understand. The reasons become clearer, however, when it is noted that an A-20 fitted with the first AI set made in this country was the only night fighter the ~~Air Force~~ ^{RAF} had in September 1941. Moreover, it was determined early in the war that the main night fighter burden in Europe would be borne by the RAF. In September 1941,

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for example, a conference on American and British war production planned that Great Britain should produce 4,380 night fighters while the United States was producing only 1,687. It may be, moreover, that the potentialities of the P-70 were overrated, with the result that P-61 production was not far enough along to fill up the gap when the P-70's deficiencies were recognized. Apparently General Arnold accepted British assurances that the converted A-20 was "a mighty good two engine night fighter."¹³

Another factor which had a bearing on the seeming neglect of preparations for night fighter defense was the fact that the ^{US}~~Air Force~~ was definitely offensive-minded from Pearl Harbor onward, even though a long wait was necessary before strategic bombing plans could be put into execution. A plan to assign eight night fighters to each pursuit group sent to Great Britain was never implemented. Two squadrons of DB-7's, which were originally sent to Northern Ireland to be equipped with radar and trained as night fighters were converted into light bomber units because the "crying need" was "for offensive rather than defensive air units."¹⁴

Lastly, production of the radar-equipped P-61 presented problems not encountered in the production of conventional fighters. It had been planned to produce 377 P-61's in 1943. Not only was this not accomplished, but as late as July 1944 the production rate was only 50 per month. The wartime labor shortage was a factor in holding up production. "The labor situation on P-61's at Northrup has not shown any improvement," noted ^{AC/AS, G-1, D}~~the Assistant Chief of Air Staff, MM and D~~, in May 1944. The "only

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possible means of relief seems to be production cut-backs at other factories, so that new labor sources may be available to Northrup." Some administrative bungling entered into the slow rate of delivery to combat units. Until late in 1944 a delay of one month was occasioned by the fact that part of the P-61's electronic equipment was installed at the Air Depot at Sacramento instead of in the producing factory. Moreover, by mid-1944 the AAF had concluded that the planes then in production would be those with which the remainder of the war would be fought. This included "a few" P-61's. Apparently, when a major expansion of P-61 production became possible, it was no longer felt to be necessary.¹⁵ Whatever the explanation may be, however, when the Japanese began night attacks on Henderson Field, and when the Luftwaffe came out under cover of darkness to strike American positions in North Africa, defense had to be improvised.

American night fighters in the Mediterranean. The American troops who landed in Africa were not to remain unacquainted with night air attacks for long. A French plane bombed Tafaraoui Airdrome near Oran before dawn 9 November 1942, and the attacker escaped even though an American-manned Spitfire patrol was aloft at the time. Soon the Luftwaffe swung into action, and at Maison Blanche, near Algiers, 30 Ju-87's and Ju-88's came in at night to destroy a B-17 and two P-38's in addition to a much larger number of British aircraft. Lack of airborne radar made interception of these aircraft impossible. American commanders clamored for night fighter protection, but in the autumn of 1942 an American night fighter

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squadron simply did not exist. After a particularly destructive night attack on Bône in January 1943, however, night fighters were finally imported from England. The defense of Allied bases in Africa from night bombing was to depend upon antiaircraft artillery and the RAF until July 1943. Even after American squadrons were on hand, one night fighter pilot reported: "Our procedure was ¹⁰⁰~~10~~ percent British; our equipment, our phraseology over the R/T [radio], everything but our food and personnel."¹⁶

The North African landings had taught the Allies the importance of getting GCI and night fighters ashore on D-Day. When the time came for the Sicilian invasion, a GCI station was installed on an LST and accompanied the invasion armada. Operating under control of this station, ²~~two~~ RAF night fighter squadrons which flew from fields on Malta shot down ⁷~~seven~~ planes over the beaches on the first night after the landings and destroyed a total of 48 German and Italian aircraft during the first week of the campaign. The same procedure was followed for the landings at Salerno, except that the night fighters were based on Sicily.¹⁷

The first two American squadrons to arrive in the Mediterranean, the 414th and 415th, had trained in Beaufighters in England before their arrival in North Africa. During the Sicilian campaign they engaged in sea sweeps and made intruder attacks on radar stations in the Balearic Islands. Under the direction of Coastal Command, they flew convoy escort when the weather was too bad for conventional fighters. Not until Sicily was



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firmly in Allied hands did these squadrons fly the defensive patrols for which they had been trained, and then they protected North African bases while RAF Beaufighters protected the landings in Italy. It was during the Anzio battle that American units began to operate effectively on the continent of Europe. In the meantime, the 416th and 417th Night Fighter Squadrons, also equipped with Beaufighters, had arrived in the theater and gone into action in Italy and Corsica respectively.¹⁸

American night fighter crews were not idle during the months between the invasion of Sicily and the landings at Anzio. The German Air Force increased its offensive activity after November 1943. Also, after that time, the Germans sent several small formations of bombers out on the same night to hit widely separated targets rather than using a large number of bombers to strike a single objective. It was during such a raid as this that a lucky hit on an ammunition ship in Bari Harbor destroyed 17 other craft as well. When the enemy was using such tactics as these, the squadron was too large a unit for the most effective use of planes and crews. Hence detachments made up of a few planes and a few more crews were often separated from the body of the squadron and stationed at some other threatened spot. Four to six planes, with six to eight crews, seemingly could carry on normal defensive patrols as well as could an entire squadron.¹⁹

To form an estimate of the effectiveness of American night fighter units during the early months of the Italian campaign is a difficult matter.

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Only five enemy aircraft were confirmed destroyed by the four squadrons during 1943, and some of these were downed in daylight on convoy patrol. On the other hand, patrols were flown every night in North Africa, Sicily, and Italy, and while the Germans scored an occasional success, as at Bari, their night bombing effort in the Mediterranean was as a whole rather unsuccessful. It would seem reasonable to conclude that night fighters were a fairly effective deterrent; certainly the patrols over convoys deprived the Luftwaffe of good targets. It must be remembered, however, that the RAF had a dominant part in these activities; to give too much credit to American Units would be inaccurate.²⁰

Nonetheless, the American night fighter squadrons were not wasting time. Constant patrolling, the many unproductive chases, and the occasional burst of cannon fire which signalled an attack pressed home were all part of the combat experience which prepared crews for a real test when it should come.

The test came after the landing at Anzio in January 1944. Within this cramped beachhead, which had to be supplied by sea, were many lucrative targets, so closely packed together that a stick of bombs dropped almost anywhere within the Allied lines would do damage. As soon as the invasion began, the 414th Squadron set its Beaufighters to patrolling the Ligurian and Tyrrhenian Seas. These patrols were credited with turning back German raids from the seaward, and on the night of 23 January the squadron destroyed one Heinkel 177 bomber. Before the end of the month this squadron

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had destroyed a second bomber, probably destroyed a third, and damaged a fourth.²¹

Until April 1944 the main burden of the defense of Anzio was borne by the 415th Squadron and the RAF 600 Squadron. The 415th encountered many difficulties. Antiaircraft fire was the first hazard noted: "We are fired on by friendly flak more than we are by enemy flak." Nor was flak the only obstacle encountered. "On almost all occasions . . . [the patrols over Anzio] have encountered both ground and air jamming of radar sets . . . [and] enemy night fighters have been in the area working on us." This is the only reference to German night fighters noted, but crews in other units reported extensive German use of window, strips of metallized paper which interfered with the operation of radar sets. The 415th Squadron's Beaufighters were still equipped with Mark IV radar, and this proved quite a handicap in intercepting low flying planes which scattered window. As a result, only two confirmed kills were made by the unit in its three months of operation over the beachhead. It should be noted, however, that 600 Squadron, also equipped with Mark IV, had a much better record than the 415th.²²

Because of difficulties with the outmoded Mark IV radar, the 415th and 600 Squadrons were withdrawn from the defense of Anzio in April 1944 and assigned to the 62nd Fighter Wing to patrol the Naples area. To replace them at Anzio the 416th Night Fighter Squadron, whose Beaufighters were equipped with uncompromised Mark VIII AI sets, was brought in.

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A detachment of the 416th had taken part in the earlier weeks of the Anzio campaign, when the situation was so desperate and quarters over the Allied positions so cramped that for 17 days it was permissible to fly over enemy territory with the new equipment. Between 28 January and 25 May 1944 the 416th Squadron flew 241 missions over Anzio and 271 over Naples plus 30 convoy-cover patrols. These missions resulted in the destruction of six German bombers, and the probable destruction of two others for a loss of two Beaufighters. As a bit of statistical information, it is worthy of note that this squadron, while flying 542 missions, had made AI contact with hostile planes only 33 times, and had brought down no more than ¹⁷eight of these. ²³

Anzio was bombed, of course, many times, but the night fighter patrols were effective enough that the beachhead "saw few enemy bombers" after 31 January. ²⁴ There can be little doubt that the weight of bombs delivered on Allied positions would have been much greater had night fighters not been on guard. This is not to say that in the absence of night fighters the Luftwaffe could have made the position of the Allies untenable. It is true, nonetheless, that any men and material saved from destruction by the RAF and AAF Beaufighter patrols contributed to the offensive power of the Allies when the drive to the north finally got under way.

In the meantime the 417th Night Fighter Squadron had been sent from Algeria to Corsica. A Beaufighter from this unit shot down a JU-88 off the coast of Spain in March, and damaged another in April. The patrols



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over Corsica were unable to prevent a heavy German attack before dawn on 13 May, however. The 340th Bombardment Group, based at Alesan, suffered the loss or damaging of 65 B-25's and 91 men killed or seriously wounded. Night fighters did not succeed in checking the fury of the enemy attack in this case, but the 417th Squadron did claim one HE-177 probably destroyed and another damaged.²⁵

After the push north of Rome the night fighter squadrons on the Italian Peninsula continued to fly patrols, though ~~their main effort~~ after September 1944, was devoted to intrusion. Considerable time was devoted to practice missions. During November the 414th Squadron, flying from Pisa and Pontedera, frequently had planes vectored on bogeys, but these vectors resulted in few firm AI contacts and no kills. Even when AI contact was established, the Beaufighters were unable to overtake fleet reconnaissance planes. Lest it be thought that these seemingly unproductive patrols were a waste of effort, it should be noted that by early 1945 Allied defensive patrols and intruder activity, the latter performed in part by night fighters, prevented even reconnaissance over Allied lines until the Luftwaffe sent in jets which were fast enough to carry out daylight reconnaissance. A P-61 of the 414th Squadron encountered a jet near Viareggio 16 February 1945 and, having advantage of altitude, pursued in a 400-mile-per-hour dive. The jet escaped easily.²⁶

The 416th Squadron, which remained in Italy until the end of the war, received Mosquito aircraft in place of its worn Beaufighters in late 1944.

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This superiority was demonstrated in February 1945 when one of the squadron's crews made AI contact with an enemy plane and lost an engine at the same time. After a long chase on a single engine the Mosquito overhauled a JU-88 and shot it down; the score was even, however, because the crew did not dare use the overtaxed engine for a landing, and bailed out over their base.²⁷

Other American squadrons in the Mediterranean continued to fly Beaufighters almost until the end of the war, and only the 414th had an extended period of operations with the P-61. The 417th Squadron had a high casualty rate from crashes which were blamed in part upon contaminated gasoline but mainly upon the dilapidated condition of the unit's planes. This organization lost 18 planes during 1944 and 1945, but it should be noted that this was only slightly more than the losses endured by the 414th and 416th Squadrons. Discontent was expressed, however, perhaps because the losses were operational rather than in combat:²⁸

. . . crews were using Beaufighters which should have been condemned long ago. All of the planes were at least three years old and some had been veterans of the Battle of Britain, with a record of overhauls which virtually stunned visiting American technical representatives. Several Beaufighters were received as replacements for crashed planes which the engineering section recognized as ships which sister night flying squadrons had turned back for salvage.

Planes from the 414th, 415th, and 417th Night Fighter Squadrons were based on Corsica for night patrols during the invasion of southern France. The 417th alone flew 171 missions in support of the landings. It was perhaps fortunate that German air reaction to this invasion was slight. As

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had been the case in Sicily and at Salerno, GCI stations were located on LST's off the beach, but the shore gave off permanent echoes of such intensity that it proved almost impossible to detect an enemy plane approaching from the mainland. Enemy reaction was slight, however; the 414th Squadron reported that during its patrols of the beachhead it had met with no significant enemy air activity, but that it had met serious opposition from Allied flak, especially from naval vessels.²⁹

Soon after the beachhead was secure, ³night fighter squadrons, or detachments thereof, were moved into ⁴southern France, though the 414th went back to Italy for patrol and intruder work. The 417th established its headquarters at Salon de Provence, France, 12 September 1944. The 415th Squadron moved into France 1 September 1944 and destroyed an FW-200 and an HE-111 before the end of the month. This unit was attached to the First Tactical Air Force "with the task of supporting the American 7th and French 1st Armies [sic]. Thus the squadron was changed in the true sense of the word [from] night fighter to night intruder."³⁰

During 23 months of combat the ⁴four night fighter squadrons in the Twelfth Air Force had destroyed 26 enemy aircraft, probably destroyed ¹⁰ten more, and damaged 13.³¹ In terms of destruction alone they had hardly justified their existence. On the other hand, their existence was one of the reasons they had few opportunities to destroy enemy planes. They had served their function when they flew patrols and prevented German attacks as well as when they destroyed German planes making attacks.

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Thus their efficiency is not to be measured in terms of planes destroyed, but in terms of the decline in German night bombing. Other factors entered into this decline, of course, but night fighters must receive a share of the credit.

Night fighters in France and Germany. Night fighter defense of the Allied troops and bases in France after the Normandy landings was in the main a province of the RAF. Six British squadrons were operational as compared with two American, though the number of American units may be considered to have become three when the 415th Squadron came up from the south with the Seventh Army. But in the main American night fighter participation in the drive across France and into Germany was accomplished by the 422nd Squadron, attached to IX Tactical Air Command, and the 425th Squadron, attached to XIX Tactical Air Command. Another squadron, the 423rd, had been shipped to the United Kingdom, but had been converted into a night reconnaissance unit. It should be noted that this predominance of the RAF was in accord with plans made before the United States became a belligerent.³²

It was not until July 1944 that the two American squadrons in Great Britain were ready for operations. Indeed, the RAF seems to have had serious doubts as to whether the P-61 was a good enough night fighter to operate on the western front. There was talk of converting American squadrons to Mosquitoes until competitive tests carried out in June 1944 demonstrated that the Black Widow was as good as, if not actually superior

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to, the British aircraft. Even so, it was the RAF which assumed responsibility for night defense of the Normandy landings. As late as July, when the P-61's became operational, they acted under British control and were used against buzz-bombs. Although comparatively few sorties were flown, the 422nd Squadron claimed to have shot down four of the robot craft.³³

German activity in the air was less than had been expected during the Allied drive across western Europe. For that reason, the intruder sorties flown by night fighter squadrons were more significant than the defensive patrols. While both units flew many intruder sorties, the 422nd Squadron was destined to carry out more of the conventional functions of a night fighter organization than was the 425th. As a part of XIX TAC, the 425th had the function of protecting the flank of the Third Army during the drive to the Rhine. Since it encountered few enemy planes, it had little opportunity to run up a score of bogeys destroyed, and most of its attention was devoted to ground units of the German armies.³⁴

The defensive operations in which the 425th did engage during the autumn of 1944 were hardly productive. Between 17 September and 9 October 1944, 211 patrol missions were mounted. As a result of these missions, the squadron made visual contact with 37 planes; ²three of these were not identified, 34 turned out to be friendly, and none were shot down. The squadron went on a largely defensive status again when the Third Army reached the Rhine, because it was expected that the Luftwaffe would react strongly to this development. "The enemy did put up quite a few flights, but none seemed anxious to press the attack."³⁵

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The 422nd Squadron encountered more enemy planes. During August this unit claimed three bombers destroyed, four probably destroyed, and one damaged. The Ninth Air Force was more generous than the squadron intelligence officer, and gave credit for six destroyed, one probable, and one damaged. For the last three months of 1944 the 422nd Squadron flew 508 patrols, resulting in 484 GCI chases and 301 AI contacts. Visual contact was made on 154 occasions, but most of the planes intercepted were friendly. Fifty-one bogeys were identified as hostile, however, and 22 of these were shot down. Most of this destruction was accomplished during the Ardennes Counteroffensive; during December 38 hostile planes were sighted and 16 destroyed. The 425th Squadron, though still seeking communications targets on intruder missions, managed to shoot down five German bombers in December. Although the units concerned claimed only 21 planes destroyed during the month, Ninth Air Force credited them with 23 destroyed, ³three probable, and ³three damaged.³⁶

Weather and a growing fuel scarcity held back the Luftwaffe during the remainder of the war. This was perhaps just as well, because a scarcity of airplanes and parts handicapped the two P-61 squadrons. Maintenance difficulties for the few planes on hand were so serious that the 422nd Squadron operated part of the time during the Ardennes campaign with only four planes in commission. AI failure ended a number of attempted interceptions, and several German planes escaped when the first burst of fire from the P-61 guns caused the nose wheel to drop, thus breaking the firing circuit.³⁷

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April brought about a situation which was ideal for night fighters. The area held by the Germans in the Ruhr pocket was within range of American GCI, and the Germans ^{tried} attempted to bring in supplies and to evacuate personnel by means of air transport. P-61's were therefore able to fly combined patrol and intruder sorties, with the result that the 422nd Squadron and a detachment of the 414th which had been sent from Italy destroyed 15 enemy aircraft, mostly JU-52 transports.³⁸


During its period in combat the 425th Squadron, concentrating upon intrusion, destroyed eight German planes, probably destroyed another, and damaged two more. The 422nd flew many more defensive patrols and destroyed far more enemy aircraft. From its entrance into combat this unit was credited with destroying 42 planes and claimed ^{five} buzz bombs in addition. In all 1,480 patrol sorties had been flown, and AI contact had been made 63 percent of the time after GCI gave a vector. Fifty-five percent of AI contacts resulted in visual contact, and of 339 planes sighted, 78 were proved hostile. No less than 68 percent of these were destroyed. The historian of the 422nd Squadron proudly and correctly noted that the unit had destroyed more German aircraft than all other American night fighter squadrons in the ETO combined.

No superiority in tactics or morale can be assigned as the reason for the greater success enjoyed by the 422nd Squadron in destroying enemy aircraft. Morale was good, but there was no indication of serious morale problems among the other units. The tactics used for intercepting German




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planes were the same as those used by other units. The only explanation is simply that the 422nd Squadron was on hand when the enemy made a heavy night effort ~~to a greater extent than the other night fighter squadrons.~~ It is worthy of note that a detachment of the 414th Squadron destroyed more planes in a few nights over the Ruhr than the entire squadron destroyed elsewhere throughout the war. The 422nd did operate with P-61's throughout its period of combat, but so did the 425th Squadron, which destroyed less than one-fifth as many planes. It seems safe to conclude that had any one of the other units been assigned to IX TAC, its record of planes destroyed would have been comparable.³⁹

Night fighters in the war against Japan. In the Pacific War American night fighter aircraft were to play a more important part than ~~had been the case~~ in Europe, because there were no seasoned RAF squadrons to carry part of the load. There was no serious need for night fighters during the first year of the war because the Japanese enjoyed such overwhelming air superiority that they could operate in daylight with impunity. Usually it was the few American bombers which had to seek the comparative safety afforded by darkness. Only when the vast distances over which the Japanese supply lines had to function, combined with increasing American aircraft production, had made daylight raids too costly for the enemy did the need for airborne night defense become acute. From about 1 January 1943 until the end of the war, however, night attacks by the Japanese Air Force were the rule rather than the exception.



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The 6th Squadron, an organization dating back to the First World War, was designated a night fighter unit by ~~VOGO~~^{VO} of 18 January 1943. Two detachments, equipped with P-70's, were rushed to the front, Detachment A to Port Moresby, Detachment B to Guadalcanal. These two fragmentary organizations were the only designated night fighter defense in the South and Southwest Pacific areas until the arrival of the 418th and 419th Squadrons late in the year. The 6th Squadron defended Hawaii during most of the war and sent detachments to the Marianas and Iwo Jima, but few of the personnel in these two early detachments ever returned to the parent unit. Instead, they were absorbed into other organizations or sent home.⁴⁰

The P-70's at Port Moresby soon demonstrated their shortcomings, though a Sally bomber was shot down while on its bomb run at 18,000 feet in May 1943. Thereafter raiders came in at 24,000 feet, at which altitude it was practically impossible for the P-70's to intercept. Next, an attempt was made to use the P-70 in coordination with searchlights, but they proved a failure in this role as well. The resourceful men of the detachment proceeded to make room for a radar observer in a P-38 and to install SCR-540 AI radar and VHF radio equipment in a belly tank. This makeshift night fighter proved able to climb to the P-70's top altitude in 11 minutes, but unfortunately it had not been tried out against Japanese raiders when the detachment was relieved. If this experiment had been carried through, it might have made a significant difference in the American night fighter program. For a while in early 1944, General Arnold was

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considering using P-38's equipped with ASH radar as a stopgap until P-61's became available, because of the urgent need for night fighters in the Pacific. A report on the tests made with this aircraft was not enthusiastic, but it asserted that the two-place P-38 could make interceptions which would be impossible for the P-61. . Perhaps this airplane could have turned back the Japanese over Leyte, a feat which the P-61's could not perform.⁴¹

Detachment B at Guadalcanal also made contributions to the development of night defense tactics. In the beginning no GCI was in place, and attempts at interception without it were abortive because the early warning radar used for ground control could not determine the altitude of enemy planes. Even when GCI had gone into operation, however, the P-70's weaknesses inhibited successful interception, and these night fighters shot down only one Japanese raider while in use on the island.

Eventually at least a partial solution to the problem of night defense was developed. At Henderson Field, though enemy planes sometimes slipped in undetected when Allied planes were landing, warning of an impending attack was usually received from coast watchers or early warning radar about 45 minutes before bombs were released. This enabled defensive fighters to be scrambled and to reach altitude before the raiders arrived.

The Japanese night bombers usually operated in good weather when the moon was bright. The raiders usually came in relays, and were over the field at intervals throughout the night. One or two planes bombed at a

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time, making a shallow dive and releasing the bombs from 21,000 to 28,000 feet at maximum speed. Often each plane made several runs, spacing them at intervals of about 15 minutes, and sometimes two planes made the first run together then came back separately from different directions.

A combination of P-70's and P-38's was used in the first attempt to find a solution to the problem of intercepting these night bombers. Two P-70's and two P-38's were scrambled when warning was received; the P-38's orbited over the field while the P-70's took up separate positions 50 miles away on the usual approach or departure routes. When the approaching bogey was picked up by GCI, usually about 60 miles out, the controller attempted to direct the nearest P-70 into AI range, holding the second in reserve. If the P-70 succeeded in making AI contact, it chased the bomber on across the target area; if not, it broke off the attempt ^{ten} miles from the field and fighter control took over.

Fighter control's weapon was, of course, the pair of P-38's over Henderson Field. One orbited at 17,000 feet, the other at 20,000 ^{feet}. The top fighter attacked bogeys which came in at its altitude or above; the lower one waited for those which came in below 20,000 feet. The P-38's made no attempt to intercept unless the raider was illuminated by searchlights, but they were frequently able to score kills when illumination took place. If the bogey succeeded in evading the searchlights, as frequently happened, the P-70's tried again as he left the area.

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When the P-70 had demonstrated its incapacity, it was withdrawn from the defense of Henderson Field and, with radar removed, used for intrusion or PT boat escort. In the latter role they proved useful, since the torpedo boats had been attacked several times by Japanese float planes, with which the P-70's could hold their own at low altitude.

After the P-70's had been withdrawn, the airborne defense of Henderson Field at night was in the hands of the P-38's. These were manned, mainly, by pilots of Detachment B. An attempt was made to vector the twin-boomed fighters with GCI, but it proved impossible for the ground controller to bring them near enough for visual contact to be established. Hence, ~~the P-38's~~ worked only with searchlights when ~~they~~ flew at night, ^{B. F. -} Approaching raiders were illuminated as soon as they came within searchlight range, and the fighter, which orbited a filtered light one mile out of the target area, attacked any aircraft caught in the searchlights. In case the fighter pilot did not see the illuminated bogey he was notified by radio that a raider was in the searchlights, and could usually find his quarry in the cone.

The pilots who flew the P-38's agreed on a number of principles to guide such searchlight cooperation missions. It was found that a piece of red cellophane over the gunsight reduced glare without completely shutting out light from outside. Experienced pilots agreed that the fighter's speed should be little greater than that of the bomber when the attack was made and that it was necessary to approach the bomber closely before opening

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fire. If the distance between the two planes was more than 200 yards, muzzle blast from the fighter's guns often caused the pilot to lose sight of his target. Other points emphasized were constant orientation with the position light, knowledge of the speed and altitude of the approaching bomber, and the conservation of fuel, the latter in case a second raider followed the first across the target.

Two serious disadvantages were apparent in this method of night defense. In the first place, the P-38's were not effective unless weather and visibility were good. This disadvantage was partly nullified by the Japanese liking for good weather and a full moon for their night attacks. A more serious disadvantage was the fact that the raider almost always reached his bomb release line before interception could take place.

Although fighter-searchlight cooperation could not force the enemy to bring his night attacks to a halt, it was more effective than might have been expected. Of two bombers which attacked Guadalcanal on the night of 13 May 1943, one was destroyed and the other probably destroyed. Six nights later, 12 or 14 planes came over in flights of ²two, the individual aircraft making their runs from different directions, thus dispersing the searchlights. In addition, the defending fighters were handicapped by a thick ¹⁰haze. Even so, the five P-38's which engaged the bombers managed to destroy ²two of the 11 bombers illuminated. No longer could the Japanese hope to make persistent night raids upon Guadalcanal without paying a price. ⁴²

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Still, fighter-searchlight cooperation was an improvised defense, no real substitute for adequate night fighter patrols. It was better than nothing, and undoubtedly deterred the Japanese somewhat. It should be added that Naval and Marine fighters aided the P-38's in their attempts to ward off attacks on Guadalcanal. Nonetheless, during 1943, "it proved impossible to prevent the Japanese from inflicting some damage on the planes at Barakona, Munda, or Guadalcanal." The scattered successes of the fighter-searchlight missions "merely emphasized the absence of any adequate night fighter defense."⁴³

Unfortunately, it cannot be said that the arrival of the 419th Night Fighter Squadron at Guadalcanal contributed anything to night fighter defense of that island during 1943 or early 1944. This unit had received the regular course of instruction in the United States, and 15 pilots, 13 radar observers, 12 gunners, and 245 officers and men of the ground complement arrived at Henderson Field, 15 November 1943, equipped with everything except aircraft. On Guadalcanal the unit absorbed 16 pilots, 15 observers, three P-70's, and eight P-38's formerly assigned to Detachment B. ~~The commanding officer was killed in a crash a few days after arrival, and the ranking officer of the detachment succeeded him.~~

In Florida the 419th crews had trained in P-70's, and they had come to believe, whether through wishful thinking or otherwise, that they would be equipped with P-61's when they reached the combat zone. They were much displeased to learn that not only would they not be provided with Black

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Widows but that they were expected to learn to fly P-38's on fighter-search-light missions. If the unit history is to be believed, a nearly complete breakdown of morale ensued.

A high accident rate was probably a result of low morale, and it no doubt contributed to keeping morale low. In the first two weeks after they arrived on Guadalcanal, the 419th Squadron wrecked one P-70 and three P-38's. Between the 16th of November and the end of 1943 the squadron had flown three night patrols and six scrambles in the P-38's without results, four P-70 intruder missions, and four daylight P-38 sorties. This slight contribution to the war had cost five planes lost or wrecked and four men killed. Moreover, the 419th kept its record consistent for a long time; on the first 368 P-38 patrols flown by the unit, not a single Japanese plane was destroyed. It followed as a matter of course that the squadron received a well-deserved bad reputation, and this lowered morale further.⁴⁴

The 418th Night Fighter Squadron enjoyed a little more success after going into action at Dobodura, where it flew night patrols and daylight strafing missions in P-70's. After moving to Finschhafen in March 1944, the squadron flew defensive patrols over Cape Croisilles and Karkar Island by using Saidor as a staging base. In May the squadron went to Hollandia, then on to Morotai in September. During this period the organization was a night fighter squadron more in name than in fact. The P-70 was a failure in New Guinea as elsewhere, and, while some patrols were flown, they were used mainly for intruder missions.⁴⁵



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The story of the 421st Night Fighter Squadron is very similar. This unit arrived at Milne Bay 4 January 1944, and an advance echelon was in action at Nadzab in P-38's by the end of the month. In April a detachment went to Saidor, which was used as a base for intruder sorties in P-70's until the squadron received P-61's in June 1944.⁴⁶

There were no experienced GCI controllers in the Pacific, and it was inevitable that confusion should ensue when green crews were directed by green controllers. On the night of 21 January 1944, for instance, "One plane was scrambled to intercept plot of [our] own night fighter. Then [the] night fighter who caused plot was vectored back to [Cape] Gloucester to intercept [its] own plot, and was then fired on by friendly AA over area." An outraged officer of the 418th Squadron signed a statement directed to "All Concerned" as follows: "While visiting Fighter Sector Control at Finschhafen on 21 January 1944 at about 2230/L, I heard the controller playing dance music on the tactical receiver." It was not at all uncommon for returning night fighters to be fired upon by antiaircraft, and friendly planes which had failed to turn on IFF after leaving enemy territory necessitated many needless scrambles and interceptions. Inexperienced controllers rendered the night fighters sent to the Fourteenth Air Force practically useless until more experienced men were sent to replace them.⁴⁷

The amount of damage done by night bombers in their attacks on Allied bases cannot be accurately evaluated, but it was not so slight that it could be shrugged off. A raid on Guadalcanal on the night of 20/21 March 1943

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damaged 14 out of the 15 B-24's which the 307th Bombardment Group had on hand, and also put out of commission ¹five B-17's of the 5th Group. Another shower of bombs on the 307th Group area in May 1943 killed six men and injured four. During November 1943 night bombing at Bougainville damaged ³three Allied ships and sank ¹one, destroyed a large amount of fuel and ammunition, killed 24 men, and wounded 96. Perhaps the most insulting blow of all was delivered at Wakde on the night of 5 June 1944 when Japanese bombs destroyed the camp area of the 421st Night Fighter Squadron. After a similar attack a few days later had put every bomb along the runway at Wakde or in the adjacent dispersal area, General Kenney was informed that the enemy was still capable of good night bombing with the aid of a full moon. ⁴⁸

When P-61's finally arrived, a much better defense could be offered against night bombing attacks, though it must be added that P-61's ¹never proved able to prevent such raids. The 419th Squadron received the new planes in May 1944, and during June one detachment of six planes went forward to Nadzab, and another detachment went to the Admiralties. The 421st Squadron began flying P-61's off Wakde in June, and moved to Owi Island before the end of the month. General Kenney gave credit to the installation of P-61's at Wakde for bringing a halt to damaging Japanese raids. It was not until 7 July that a raider was brought down, but this was the first aircraft destroyed by a P-61. The 418th was the last of the three original night fighter squadrons in the South and Southwest Pacific to be equipped

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with P-61's. The unit turned in the B-25's in which it had been flying sea sweeps and intrusion sorties in August 1944, however, and completed transition to P-61's in time to take part in the defense of Morotai.

When the Japanese realized that they were opposed by radar-equipped night fighters, they adapted their tactics to the new opposition. Extensive use of window became common, though this does not appear to have greatly interfered with the Black Widows. More successful was the plan which sent fighter aircraft over the target at low altitude to draw off the P-61 patrol while the bombers made their run from above 20,000 feet. Lastly, night raiders took every possible advantage of terrain, a tactic which was very successful at Morotai.⁴⁹

The defense of Morotai was probably the most difficult task undertaken by American night fighters during World War II. The island-hopping campaign which took Allied forces to Morotai left Japanese air bases ~~on every~~ ^{how many} ~~side.~~ ~~Enemy airfields~~ on Mindanao, in the Palaus, in the ~~Halmahera~~, in the Celebes, and in Borneo, surrounded Morotai, which was thus in the ~~center~~ of a rough circle of enemy airfields. Planes based there could, of course, attack any point on the circumference of the circle, but night fighter defense was concerned with the fact that bombers from any point on the circumference could strike at Morotai.

The number of Japanese bases within range was not the only problem. Halmahera, just south of Morotai, is mountainous, as is Morotai proper. Thus early warning and GCI radar showed many permanent echoes, that





is, reflections from the terrain which amounted to blind spots through which enemy bombers could slip undetected. As a result, bombing attacks could begin before the ground installations or fighters had had adequate warning. Even when GCI was able to plot the attackers, the permanent echoes handicapped the defense. "The longest range in which the night fighter had to operate was a distance of forty miles with the other distances sometimes as short as eight miles."⁵⁰ An added complication was the fact that Allied night bombers, "not a few . . . without IFF for reasons best known to themselves," were using the Morotai airfield extensively.⁵¹

P-61's of both the 418th and 419th Squadrons had their hands full at Morotai. During December alone enemy planes came over on 20 nights. Sometimes raiders were picked up by radar before they entered the permanent echo region, and a P-61 could lie in wait on the expected course. Such was the case with a 419th Squadron crew which made a free lance contact at two miles in January 1945, brought down one Betty, and claimed to have forced two others to jettison their bombs.

P-61's and antiaircraft artillery were not the only opposition encountered by raiders at Morotai. P-38 searchlight teams were still active and sometimes successful. The 418th Squadron claimed to have destroyed four out of five bombers illuminated on three successive nights in November.⁵²

A committee composed of GCI controllers, radar maintenance and operation officers, radar observers, a P-61 pilot, and two operations analysts investigated the performance of the P-61 in the defense of Morotai.





The analysis was based upon 33 of the 63 Japanese raids which took place between 8 October 1944 and 11 January 1945. Sixty-one interceptions were made by P-61's during these 33 attacks. Apparently an interception was considered to have taken place when AI contact was established and the GCI controller had turned the chase over to the crew of the night fighter. At any rate, ~~five~~ of the 61 interceptions were successful to the point that the enemy plane was shot down.

In evaluating the work of GCI controllers, the committee decided that their performance had been efficient enough to be classified as good 32 times. On 16 interceptions the controller's job was rated only fair, while 13 performances were evaluated as poor. In considering the performances of the two squadrons, the committee found that the 419th had been superior to the 418th ^{in number of interceptions} ~~percentage-wise~~, but that the 419th had only 17 interceptions to the 418th's 44. The poor ~~percentage~~ performance of the 418th was attributed to the fact that GCI control for that squadron turned the chase over to the radar observer and pilot as soon as AI contact was made. It was strongly recommended that the controller should handle interception "until the night fighter is on a following course and reports solid AI contact at a range under five miles."

The committee concluded that the P-61 was an adequate night fighter, and that radar failure was responsible for more abortive missions than any other malfunction. In fact, the P-61's radar gave satisfactory performance only 81 percent of the time. No note was taken of jurisdictional overlapping



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between GCI and Fighter Control, which the 419th Squadron had held responsible for the escape of several Japanese aircraft.

There were a number of recommendations. GCI was urged to put the night fighter on the bogey's tail at not more than three miles distance. As noted above, the controller was also urged to retain control of the chase until good AI contact was established at less than five miles. The crew of the night fighter was able to carry out its task better when kept constantly informed of the enemy plane's altitude, course, and approximate speed. For the last two miles of the interception, the night fighter's speed should not be more than 40 miles per hour faster than that of its quarry. It was necessary for the radar observer, after AI contact had been established, to give his pilot range and clock positions frequently. Head-on approaches were permissible under the conditions which existed at Morotai, but their successful execution required a great deal more skill than conventional approaches. Lastly, it was recommended that the GCI controller should not attempt to handle more than one interception at a time.⁵³

In the meantime, another campaign was going on in the Central Pacific, and in this area also night fighters had a part to play. The 6th Night Fighter Squadron, in addition to sending detachments to the South and Southwest Pacific early in the war, had provided night defense of Hawaii. In May 1944 this unit turned in the P-70's and P-47's in which it had been flying uneventful patrols; in exchange it received new Black Widows. Transition training was carried out rapidly, and the squadron was ready to go into action from Saipan soon after the invasion of 16 June 1944.

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Two detachments were sent to the Marianas, and the P-61's began patrolling 24 June 1944. The Japanese were active, and the bombers which came over on moonlit nights were sometimes escorted by fighters. Between 24 June 1944 and 21 July 1944, Saipan-based P-61's made 37 attempts to intercept enemy bombers. A tabulation of these attempted interceptions reveals the following. In ¹²~~ten~~ cases the Black Widows were not able to establish AI contact with the planes on which GCI vectored them. By using violent evasive action, 14 of the 27 aircraft with which AI contact was established were able to escape. In ⁸~~eight~~ cases, the P-61 had to break off the chase when the bogey entered a friendly antiaircraft zone. Of the remaining ⁵~~five~~ bombers, ³~~three~~ were claimed as definitely destroyed, ¹~~one~~ as probably destroyed, and ¹~~one~~ as damaged.

Since the Japanese consistently preferred clear moonlight nights for their attacks in the Central Pacific, as was also the case elsewhere, it was sometimes possible for their bombers to have fighter escort. One P-61 pilot, engaged in tracking a raider, was disconcerted to discover a pair of fighters opening fire on him from the rear. Thus rudely transformed from hunter to hunted, the P-61 swung into violent evasive action and managed to escape. Such incidents were not common, but protection against their recurrence was provided in January 1945 when replacement Black Widows reaching the 6th Squadron arrived with backward-searching warning radar installed.

Night raids on the Marianas did not cease in mid-1944. The enemy made several efforts to strike the B-29 bases after they became operational.

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On the night of 1 January 1945, for instance, two 6th Squadron P-61's reported shooting down two Betty ~~bomber~~ bombers and one Francis. In addition to this, eight 6th Squadron crews on detached duty with the 548th Squadron on Iwo Jima destroyed several more night raiders.⁵⁴

An interesting tactic was considered for the defense of the Marianas in January 1945. Two B-24's of the 27th Bombardment Squadron were put on alert status with instructions to fly north of Saipan when ordered. When in position, they were to lower their radar antennas and search the sky for Japanese planes. P-38's were to accompany the bombers, and if a bogey was plotted, these fighters were to be vectored to intercept. Apparently this airborne fighter control scheme was never put into operation either night or day.⁵⁵ As far as night defense was concerned, it seems most unlikely that this plan could have been successful. It had already been established at Guadalcanal that GCI was not accurate enough to vector a fighter into visual contact with a bomber. There is no reason to suppose that the B-24 radar equipment could have done better.

One other plan for the use of the P-61 was as escort for B-29's on their missions over Japan. First they were proposed as long-range day escort, but this was rejected on the grounds that they were needed more for night defense purposes. Later it was proposed that they serve as escort on night missions, but this plan was never put into practice. A plan to use night fighters as escort for night bombers in Italy was rejected on the grounds that interception was too difficult for night fighters without GCI aid, and

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therefore they would be of little service in protecting the bombers. Presumably the same reasoning applied in the Pacific.⁵⁶

When the invasion of Iwo Jima was mounted, the Air Force made ready to take night fighter defense to the beachhead. The ground personnel of two squadrons, the 548th and 549th, lay on transports off shore while the Marines ^{landed,} ~~went ashore,~~ and preparations were complete to receive the flight echelon when it flew in 6 March 1945, while the fighting was still in progress. Never before had night fighter personnel been so near the enemy on the ground. These units ~~actually~~ suffered severe casualties in the last Banzai attack launched by the defenders of Iwo Jima. Patrols were aloft on the night of 7 March, and Iwo was adequately defended until the end of the war. On the whole, these units destroyed few enemy planes, and from April until the end of the war, Iwo-based P-61's devoted more attention to intrusion over the Bonin Islands than to defense. Patrols and scramble alerts continued, however, and a Japanese bomber was intercepted over Iwo as late as 1 August 1945.⁵⁷

Night fighters operated to some extent in the China-Burma-India Theater. The 426th Squadron was sent into China to protect B-29 bases in November 1944. Flying from Kunming, Chengtu, and Laohokow, this unit claimed to have destroyed four enemy planes by February. However, much more ammunition was expended on fires lighted by Japanese sympathizers to guide raiding bombers to their targets than was fired at the bombers themselves.

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Aiding the 426th in defending Asiatic bases was a sister unit with an interesting history. The 427th Night Fighter Squadron, after completing its training at Hamner Field, was sent to Italy, where it flew a few missions. Its orders had originally directed it to Pollava, Russia, where it was intended to defend the vulnerable shuttle-bomb base. When it proved impossible to get permission to enter Soviet territory, the unit was sent on to the CBI. With one detachment at Myitkyina, Burma, and another at Kunming, the 427th seems to have accomplished very little. This was due in part to inexperienced GCI personnel, in part to the permanent echoes which were unavoidable in the mountainous terrain, but the main reason for few interceptions was the simple fact that there were few enemy aircraft to intercept. ⁵⁸

To the southwest, the return to the Philippines had begun in October 1944. Japanese air reaction to the Leyte landings was strong: "With the arrival of the first Army fighters on the 27th, enemy day raids eased off considerably, but night raids continued with intense regularity." The 421st Night Fighter Squadron began flying patrols from Tacloban Airfield on the night of October 31st -- and had a P-61 damaged by friendly antiaircraft fire the same night. During November the squadron flew defensive missions both in daylight and dark; most of the enemy planes claimed as destroyed were shot down in daylight. The Japanese bombing attack did not decline in intensity. The night fighter squadron alone lost six men killed and 28 wounded as a result of Japanese bombing attacks. In December a

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detachment of flying personnel and planes was sent to Peleliu in exchange for Marine night fighters and pilots for Tacloban. It was hoped that the single place Marine night fighters would be able, as the P-61's had not been, to intercept high-altitude Japanese raiders. The 421st Squadron was reunited at Tacloban in January, then sent forward to Luzon.⁵⁹

The ground echelon of the 418th Squadron left Morotai for Leyte in November 1944, but the air echelon remained behind to play its part in the defense of Morotai. Flight crews flew to Mindoro, rather than crowded Tacloban, on Christmas Day, and served as a reconnaissance unit during the naval battle on the night of 26 December 1944. Before that night was over, enemy attacks on Mindoro forced the P-61's to fly to Tacloban, but they returned the next day and intercepted three planes over Mindoro that night. Two nights later, 29/30 December, the unit claimed to have destroyed no less than five Japanese aircraft.⁶⁰

November and December were the last months of intense night fighter activity in the Philippines, ^{— from Morotai, I, J —} and the record of the Black Widows had not been particularly good. The bombing of Tacloban had been unmerciful, and the P-61's had been unable to prevent it. ^{To explain the failure, it was said} ~~Why this was the case demanded~~ ^{the following explanation:} ~~explanation.~~ ^{the following explanation:} Lack of coordination between GCI operators and night fighters ^{was given as one of the reasons.} Another explanation offered was that the A-3 of the 308th Bombardment Wing, ~~Fifth Air Force~~, under whose direction the 421st Squadron and the 547th Squadron operated, was "Incompetent in directing night fighter operations." According to a report submitted by



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the 547th Squadron, he "knows nothing of night fighters and does not hesitate in saying he is not interested nor will [he] attempt to enlighten himself on the subject." Perhaps both of these factors had some bearing on the problem. Influential also in reducing the effectiveness of the P-61's were the primitive ground facilities and the condition of the runway at Tacloban. Most important of all, however, the P-61 aircraft was simply not adequate for the task at Leyte.⁶¹

After January 1945 Japanese night bombers ceased to be a constant threat to Philippine bases. During April, the 421st Squadron, operating out of Clark Field, had only one AI contact with a Japanese plane, and that plane escaped. So peaceful had the once hotly contested air over Luzon become, despite the continued ground fighting, that this unit set up a training program before the end of April. The 418th Squadron encountered considerable enemy activity in January, but thereafter it flew uneventful patrols until it transferred to Okinawa in July. From that island the unit's P-61's flew intruder sorties over Kyushu until the end of the war.

The 419th Squadron remained at Middleburg Island and Morotai until February 1945, at which time headquarters was moved forward to Puerto Princessa, Palawan. One detachment went to Zamboango, Mindanao, where it operated under the control of the Marine Air Corps. During May the headquarters detachment provided night cover for the Allied invasion of Borneo. In order to accomplish this, two P-61's took off from Puerto Princessa in the afternoon, carrying droppable fuel tanks, and flew to

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Tarakan. There the two fighters provided dusk cover for the beachhead, landed at Sanga Sanga, and remained on strip alert all night. They took off the next morning, flew dawn cover for the landings, then flew back to Puerto Princessa. During June a detachment was based at Sanga Sanga, where it defended the airfield, provided convoy cover through the Makassar Straits, and gave night cover over Balikpapan. In July all detachments of the 419th were reunited at Puerto Princessa, where the unit remained until the end of the war.⁶²

The 547th Night Fighter Squadron reached the Pacific in late 1944, replaced the 421st Squadron at Owi Island, and from this base sent detachments to fly patrol ~~duty~~ from Leyte and Mindoro. Of 60 combat missions flown by the 547th Squadron during January 1945, only 21 were conventional night fighter patrols. Of the remainder, 15 were flown as convoy cover, mostly in daylight, 15 as PT boat escort, and ~~nine~~⁹ were devoted to cross-country flights, strafing, close support, intrusion, or artillery spotting. By April the enemy had almost given up the use of the air over Luzon; the 547th failed to make contact with a single Japanese aircraft. When the war ended, the squadron was on its way to Ie Shima.

Another new squadron, the 550th, came to the combat zone before the war ended. During June and July 1945 the main body of this organization was based at Tacloban, and had responsibility for both day and night defense of the area. During the daylight hours it flew P-38's, and during the night it kept P-61's on strip alert. A detachment, based at Zamboango, provided

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convoy cover for the route to Borneo, then moved to Sanga Sanga ~~from~~ whence it aided the 419th Squadron in patrolling the Balikpapan area. The 550th Squadron dutifully flew its assigned patrols, but it had arrived too late to be of any real service against the Japanese Air Force. Since night bombers had ceased to be a pressing problem, the unit flew as many hours in day-light as in darkness. ⁶³

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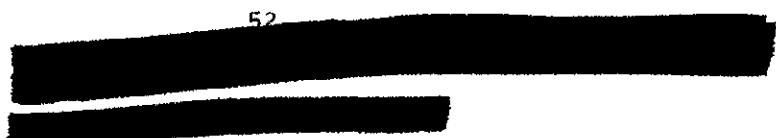
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III. AMERICAN NIGHT BOMBING DURING WORLD WAR II

Night bombing from Great Britain. Inasmuch as intruder planes often dropped bombs, it would be well to draw a line between night bombing and intrusion in the beginning. ^{since} No hard and fast distinction was made during the war, ~~so~~ the line will of necessity be ~~an~~ arbitrary ^{one}. For the purpose of clarity, it will be understood that a mission briefed to bomb a specific target ~~during the hours of darkness~~ ^{at night} was a night bombing mission; Aircraft attacking targets of opportunity will be considered as intruders.

As noted in the introduction to this monograph, the ^{A.F.} Air Force was committed to the doctrine of daylight precision bombing before 7 December 1941. The Norden bombsight and the comparatively fast B-17 ~~bomber~~ gave excellent bombing accuracy on bombing ranges in daylight. At night, against unlighted targets, the Norden bombsight could be used only in the brightest moonlight and most perfect bombing weather. Hence only area bombing, such as the RAF was committed to, was possible at night, while the AAF, in the words of its chief, was convinced that "We must operate with a precision bombsight ~~and~~ and by daylight."

The British had the advantage of experience; ~~but~~ the Americans had relatively untried method and a great deal of determination. The more objections the British raised, apparently, the more determined the Americans were to go ahead with daylight bombing. The first time General Arnold





went to England during the war, in 1941, an RAF pilot told him that day-light bombing was impossible; he heard from all sides that not only would fighters take an unbearable toll of day bombers, but also that anti-aircraft would make a precision bomb run impossible. Arnold's reaction was, "Either I am an optimist or just plain dumb, but I think the British still have much to learn about bombing." The commander of the AAF ~~also~~ seems to have been strongly influenced ^{in the past} by the operational losses suffered by the British in taking off and landing at night.

It was to be expected that the AAF should try out its doctrine of day-light precision bombing. One reason was that American crew training, ~~really~~ inadequate ^{under} for daylight operations, at this stage of the war, did not to any extent approach the standards necessary for successful night bombing. Night navigation over a blacked-out land area was beyond the capabilities of many American crews at this time, before radar had been widely adopted as a navigation aid. This last fact must have been brought home to General Arnold when navigational error took him far past Kunming, over Japanese lines, in February 1943.¹

Not only did night bombing require a "vast amount of specialized training . . . but also very special aircraft and equipment."² The B-17 was an admirable day bomber, but some of the very qualities which made it so rendered it unsuitable for night work in Europe. The 422nd Bombardment Squadron noted that ¹⁰ ~~ten~~ modifications of navigation equipment alone were necessary to prepare the Flying Fortress for night operations, and



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these modifications required 81 1/2 man-hours. ~~Insofar as communica-~~
~~tions equipment was concerned,~~ ^{For communication,} antenna loading units and Gee units had
to be installed in each aircraft. Mechanical changes, ranging from instal-
lation of blackout curtains to replacement of all non-fluminous instruments,
were 19 in number and required 125 1/2 man-hours per plane. No man-
hour figures were given for armament modifications, but six major changes
were necessary. Additional fire cut-off cams had to be installed on guns
to prevent gunners' firing into the wings and tail of the bomber during the
violent evasive action sometimes necessary to escape searchlights. The
lighted Sperry tracking sight in the ball turret blinded the gunner and
would not compute during evasive action; it was replaced with the simpler
Mark III British sight. All of the ball turret except the view plate was
blacked out, and ammunition for all guns had to be stored more securely.
Because no available sight was suitable for use with the flexible guns at
night, ~~so~~ a new reticule sight was designed and installed by the squadron
armament section. Last, but not least, flash hidiers had to be attached to
all guns to prevent the gunners' being blinded by their own fire. In the
422nd Squadron's report on these modifications, the following statement
was made: "One factor seems easily discernible. An aircraft equipped
for day or night operations cannot be used as a dual purpose weapon without
losing considerable efficiency of equipment."³

Taking into consideration the training of American crews and the
planes which they were to use, there can be little doubt that the decision

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to concentrate upon daylight bombing was ~~the~~ correct ~~one~~. It is possible, however, that doctrinal considerations were as influential as practical arguments. ~~Perhaps the practical arguments, rather than leading to the formation of doctrine, were mustered to support an already existing doctrine.~~ General Arnold wrote³ after the war, "We didn't know quite how we were going to make that [daylight precision bombing] offensive work at first . . . All we knew was that we would make it work . . ."⁴ In June 1943, when the commander of the 5th Bombardment Wing recommended night bombing of the Ruhr because long-range fighter escort was not available to the Eighth Air Force, the first reason given for disapproval by ~~the A/C~~ ^{P.C./A/S} Plans⁵ was that "The discontinuance of daylight bombing would be an admission of defeat in basic policy." It would appear that fear of compromising daylight precision bombing doctrine was a factor in the American failure to mount a program of night bombing from Great Britain.⁴

It was fortunate that this disagreement over whether bombing attacks should be delivered by night or day should have been between the air forces of two major allies. Human nature and national pride being what they are, the argument became nationalistic to some degree. Within hearing of small-arms fire in Burma in late 1944, the writer heard a heated discussion of the subject between two pilots, one British, one American, ~~It was apparent that each of them~~ ^{and some of the} felt that the prestige of his country was at stake. General Arnold's and Sir Arthur Harris' memoirs leave the impression that even



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at the highest levels the discussion was emotional as well as rational. If this was the case, it might go far to explain why night flying was neglected by American ~~air power~~ in Europe, though it was engaged in to a large extent in the Pacific.

²⁻⁷ It must be added that the AAF could afford to neglect night bombing from Great Britain, because the experienced RAF was on hand to carry on night bombing. In the Pacific, no skilled RAF night crews were available, so American night bombing was necessary if bombs were to be dropped after dark.

However convinced that day bombing was its proper role, the Eighth Air Force could not overlook the possibility that it might be driven from the daylight air and forced to operate at night if long-range escort fighters were not ready in time. Although he had held, in arguing the advantages of day over night bombing, that night flying would mean heavier losses both operationally and by enemy action for the unprepared American crews, General Eaker was influenced by the bad weather of early 1943 to order that some units should be trained and equipped for night bombing "should such become clearly necessary." A training and procurement program was initiated, but it was soon discovered that "the specialized training of crews for night operations precludes the maintenance of the required standard of proficiency for daylight operations." Only one squadron became operational at night, and on 18 January 1944 ¹¹ General ¹¹ James Doolittle, commander of the Eighth Air Force, decided that the American night training program was

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not worth the trouble, time, and effort involved. Even so, when the 1st Bombardment Division reported in February 1945 that night flying equipment was clogging its warehouses, Doolittle retorted that no change in policy had been made.⁵

The 422nd Squadron of the 305th Bombardment Group did become operational at night, joining the RAF in an attack on Boulogne the night of 10/11 September 1943.⁶ No opposition was encountered because the B-17's bombed from 28,000 feet, above flak and fighters at this particular target. Bombing results were unobserved. Two more missions were flown against objectives in France, then the squadron took part in a mission against Hanover, Germany -- all without loss. Crews returning from the Hanover raid on 22 September felt that "From the standpoint of distance and [bomb] load the ease of this night mission . . . points to the advantages of night operations over day on this particular target, due to the light opposition encountered . . ."⁷

Such optimism did not survive a second mission to Hanover, 27 September 1943, during which "Several of the crews were coned by searchlights and some fighters were encountered," and from which one plane failed to return after being seen coned over the target and "going down in a wide spin and smoking badly." A plane was lost on each of two succeeding missions over Germany.

On eight bombing missions, all in company with the RAF, the 422nd Squadron had flown approximately 35 effective sorties for a loss of three

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planes, amounting to 8.6 percent. But all the losses were over German targets, to which only 18 sorties had been sent, meaning that the loss rate over German targets was 16.6 percent. The 422nd Squadron flew no more night bombing missions after 4 October 1943. This unit did continue to fly at night, however, dropping leaflets over France and western Germany until it was returned to daylight bombing operations in June 1944.⁸

The 422nd Squadron found that all crew members required some special training for night operations, though very little was necessary for bombardiers, since bombing accuracy depended more upon the pathfinder than upon bombing precision. Pilots required extensive practice in takeoffs, landings, and evasive action, while gunners needed instruction and practice in conserving night vision and cooperating with the pilot in evasive action under fighter attack. The radio operator had to have extensive instruction in British radio procedure and in cooperating with the navigator.

It was in navigation that the greatest difficulty was encountered. "Daylight operations with most of the navigators being little more than commissioned aerial gunners are not conducive to maintaining [sic] the skill and practice required in an acceptable night navigator. Although our navigators were not lacking in technical background, the incentive and precision necessary could not be regained in two or three night flights." Again it was noted that "The importance of highly skilled, accurate and precise navigation is paramount. The safety of the crew and airplane depend largely upon the ability of the navigator to maintain a course within a concentrated stream

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of aircraft fifteen miles wide." Not only safety, but the success of the mission depended to a great degree on navigation. ("The success of the effort is governed to a great extent by accurate timing and heading of attack. A conglomerate, poorly executed attack at night will be not only dangerous, but the results will be unsatisfactory; therefore it is absolutely essential that navigation is ~~is~~ accurate. Geographic pin-points are valuable but rare. Consequently most stress should be put upon precise DR [dead reckoning] and astro fixes."

Handwritten notes:
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The 422nd Squadron recommended that navigators receive 14 hours of ground instruction in preparation for night missions, including ~~seven~~⁷ hours review of DR and celestial fundamentals. The remainder of the ground school time was to be devoted to night navigation equipment, three hours being devoted to Gee procedure. Flight training was to consist of ~~nine~~⁹ flights, totaling 35 hours, emphasizing DR, celestial fixes, and the use of Gee. When it is remembered that American navigators were skilled enough for trans-Atlantic flights upon completion of OTU or RTU training, the degree of added skill required for night flying over Europe stands revealed as impressive. The 422nd Squadron report noted "that new replacement navigators are generally more conscientious and open-minded regarding night navigation than experienced day navigators and for that reason are just as easily or, perhaps, more easily trained."

On its night missions the 422nd Squadron always flew with the RAF, which laid out the course, emphasizing the necessity of remaining within



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the 15-mile wide stream of attacking planes. The purpose of this concentration was to saturate the enemy defenses. Bombing was done by aiming at the geographical center of ground markers, or at sky markers without making a drift correction. The crews who went on these missions found that they could not identify objects on the ground, even with flare illumination, from the high altitude at which the B-17's bombed. The usual bombing procedure was for the bombardier to kill drift with the bombsight and automatic pilot as soon as the target was sighted. When drift had been corrected, the pilot took control and performed evasive action until about 30 seconds away from the bomb-release point, at which time the bombardier made last-minute corrections. As soon as bombs were away, the pilot began evasive action which was maintained until the bomber was clear of the target area. One B-17, attacked by four fighters after bombs away, escaped by making corkscrew turns into the attackers, losing 1,200 feet to the turn.

The crew reaction to night bombing depended upon how much opposition they had encountered at night. Those who had flown missions with which flak, fighters, and searchlights had interfered little preferred night flying, but a crew which had been coned for five minutes at 30,000 feet had an emphatic yearning for day missions. Adverse morale factors other than opposition were the inability of gunners to see what lay outside their ports, a feeling that night efforts were not appreciated as much as missions flown by day crews, and the high loss rate. On the other hand, the lonely night missions had built up a greater esprit de corps within the individual crews.⁹

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In addition to the night missions carried out from Great Britain by the 422nd Squadron, a few missions were flown at night by B-26 medium bombers. The 322nd Bombardment Group was taken off operations in April 1944 in order that it might carry on a night flying training program, and flew its first night mission, against Beaumont-le-Roger Airdrome, the night of 22/23 May. For this effort pathfinders dropped ground markers, and the B-26's made individual approaches, aiming at the geographical center of the markers. A second night mission was flown in June, but tactics varied from the May effort. For the attack on a railroad junction at Coulances 33 Marauders bombed by means of flare illumination.

While the 322nd Group was the only B-26 unit on sustained night operations, the IX Bomber Command engaged in some night flying on a larger scale during mid-1944. Takeoffs for medium bomber attacks on D-Day were during darkness so that bombs could be dropped at dawn. It might also be noted that heavy bombers of the Eighth Air Force took off and assembled before dawn for their first D-Day missions. A true night mission was carried out, however, when the IX Bomber Command struck the Ile de Cézembre at St. Malo on the night of 6/7 August 1944. In the main, however, the 322nd Group was the night bombing unit of IX Bomber Command.

On 8 July 1944, General Lewis Brereton noted in his diary: "The 322nd Marauder Group, out on a night attack against buzz-bomb targets, ran into a flock of night fighters and nine of our planes were lost." Apparently a large number of German night fighters were lying in wait for the Marauders,

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for the B-26's were under attack all but a few minutes of the time they were over enemy territory. Most of the night fighters made their attacks from behind and below, and searchlights and antiaircraft cooperated with the fighters. Despite this setback, the 322nd Group ran two more night missions over France in August, but thereafter it operated in daylight as did other B-26 units.¹⁰

Thus night bombing by American units from bases in Great Britain was rare. The reasons were as already stated: American doctrine held that high-altitude daylight precision bombing was superior to area bombing; the planes available were designed for day bombing; crews were trained for day operations and lacked the skills needed at night. The few night missions which were flown resulted in a high loss rate. The Germans had had a great deal of practice ⁱⁿ ~~against~~ night defense against skilled RAF crews; it could be expected that they would enjoy a considerable measure of success against inexperienced American units. Lastly, since the British were already operating at night, it was much simpler for the Americans to leave night flying to the RAF and concentrate upon daylight bombardment.

Night bombing in the Mediterranean. American planes did a great deal more night bombing in the Mediterranean area than ~~they did~~ in northern Europe. ^{in missions} ~~This practice~~ continued until the American landings in Italy were secure. It should be noted, however, that during the early stages of the ~~North~~ African landings, American airmen did practically no night flying. American heavy bombers operated against German-held ports by day, and at night the pounding was continued by Malta-based Wellingtons. Two

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reasons, probably, can be assigned for this policy. In the first place, the crews sent to North Africa in 1942 lacked, as a whole, sufficient training for night operations. In many cases, indeed, they did not have the skills needed for daylight flying. Secondly, the navigation aids necessary for night operations by all but the most expert crews simply did not exist in North Africa prior to mid-1943. ^{June} 11

The American bomber units in the Middle East, perhaps because they were under more direct British tutelage, engaged in considerably more night work. General Lewis Brereton, who had become accustomed to night missions in the Pacific and India, was in command of these units. American B-24's flew a night mission against ~~Melita~~ Matruh on the night of 31 July 1942, and Maleme Airdrome was attacked on the night of 29/30 October of the same year in order to prevent aerial reinforcement of Rommel from Crete. These forays were exceptional, however, because the heavy bombers (operated in daylight ordinarily). It was the B-25's of the 12th Bombardment Group, later joined by the 340th Bombardment Group, which did the lion's share of American night bombing in Africa. ^{July} 12

The 12th Group arrived in Egypt during the summer of 1942 and, after a period of training largely administered by personnel of a South African A-20 squadron, began battering Rommel's troops, airfields, and supply lines. They flew night as well as day missions, despite the fact that two Mitchells were lost on the first night training mission flown. A few nights later another was shot down by the RAF. "Under the circumstances it was

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unavoidable. The plane commander, instead of following the sea corridor from the Tobruk area, turned south over the Alexandria and Delta defense area. He gave no identification signal, did not use his pipsqueak [IFF], did not show his lights, and did not fly at the prescribed altitude for friendly aircraft in distress. "13

The 12th Group continued to fly night missions; before El Alamein many attacks were made on landing grounds previously illuminated by British Lysanders. The cost of these missions was high, because the Germans soon learned to spot the bright exhaust flame of the B-25's, and on the night of 13/14 September four planes and crews failed to return from a mission against Sidi Haneish ~~A~~irdrome. After this loss it was ordered that B-25's should fly at night only in emergencies or when authorized by the commanding general of USAMEAF. 14

The ~~B~~attle of El Alamein and the enemy retreat which followed constituted an opportunity for good night work by the Mitchells, but losses remained high. On 24 October General Brereton noted: "Two B-25's collided on their first mission after 7 P. M.; one destroyed and the other a major repair job. Two others were shot down on our side of the lines. Another belly landed with its landing gear shot up. " Despite such losses, the German retreat made night bombing profitable. The night of 4/5 November "was the best night yet for air attacks. The coast road was congested, head to tail, throughout the night. Terrific carnage was reported. "15

It was not until the beginning of the Sicilian ~~C~~ampaign that American





planes again flew night missions extensively. But when Rommel put some 200 airplanes on an airfield near Tripoli in January 1943, B-25's of the 12th Group joined the RAF in a night attack. Apparently the night attacks which kept Pantellaria under pressure 24 hours a day before its surrender in June 1943 were a province of the RAF. It should be mentioned, however, that a second B-25 Group, the 340th, had gained some experience in night bombing in Africa and was prepared to play a part in the bombing of Sicily. ¹⁶

~~Night bombing did play a significant part in the Sicilian Campaign.~~
 Heavy bombers, which had begun their assault in early 1943, bombed at dusk and then flew home individually at night, but it was the twin-engined Mitchells which did most of the night bombing for the American forces. Sometimes targets were marked by pathfinders, usually RAF Bostons, but often the first plane over the target dropped flares as well as bombs, thus providing illumination for the bombers which followed. Unfortunately, the flares were often defective and failed to ignite. In all cases night bombing of Sicilian targets was done by individual planes. ¹⁷

The 340th Group was over Sicily on the night of 3/4 July, losing two planes, one of which definitely fell victim to a night fighter. The 12th Group hit Sicily the night of the landings and every night thereafter until 2 August. In conjunction with RAF Wellingtons, these American planes kept up a 24-hour attack upon German defense positions, troop concentrations, and communications. They were credited with excellent bombing results, and they soon added leaflets to their bomb loads, thus striking at enemy morale in two ways. ¹⁸



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It is apparent from the account thus far given that B-25 losses were higher when night missions were flown. This can be shown statistically from the records of the 340th Group, which flew 110 missions, comprising 1,439 sorties, between 1 April ~~and 1943~~ and 16 August 1943. Ten missions, totaling 134 sorties, were flown at night. Thus the average number of planes per mission was 13 both day and night. There was an average of one abortive sortie per mission day and night. Eleven planes were lost during the period, four of them at night. The loss rate for day missions, then, was less than 0.5 percent while the loss rate at night was 3 percent. Twenty-nine planes, or 2 percent of the day sorties, were damaged, while 3 percent of those going out at night were damaged.¹⁹

In the case of the 340th Group, then, losses at night per 100 sorties were six times as great as day losses per 100 sorties, and more planes were damaged per 100 night sorties than per 100 day sorties. The causes of the higher loss rate at night are a reasonable subject for speculation. In all probability, exhaust flame was ^{one factor} a factor, since the exhaust flame on American bombers was a hazard noted in Europe, the Pacific, and in China. Secondly, since the bombers came over the target singly in night raids, ~~their whereabouts betrayed by exhaust flame~~, they were individually easier prey for fighters and antiaircraft guns than ~~was the case when a formation went over a target in daylight~~. When a formation went over, it was visible, but the antiaircraft guns had more than one target at a time and the time of exposure was less. So far as fighters were concerned, the

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formation offered more defensive firepower than a single plane, and day missions were frequently escorted by friendly fighters. A third factor to be considered is navigation, always more difficult over land at night than in daytime. ~~In regard to navigational difficulties, it might be well to cite a mission (of the 340th Group) a month later than the period under review.~~ During a night raid on a German airdrome in Italy, one plane was shot down over the target by a night fighter, but five became lost through faulty navigation on the way back to Sicily. Three of these managed to find airfields and to land safely, but the other two went down at sea.²⁰

As soon as suitable airfields were available in Sicily, the 12th and 340th Groups were moved forward from Africa so they could take part in the invasion of Italy, and again quite a few night missions were flown. The Germans retreating before the British Eighth Army afforded few worthwhile targets, but airfields and communications which might affect the Salerno landings were struck repeatedly. American B-24's even flew at night, hitting the airfields at Manduria and San Pancrazio after dark, 7 September 1943. RAF Wellingtons, aided by Liberators and Halifaxes of the RAF Middle East, bore the main burden of night work, but again B-25's went out at night, especially during the critical period at Salerno. During 60 days, while based in Sicily, the 12th Group flew 140 missions, 40 of them at night. Attacks after sundown reached a high pitch on the nights of 9/10, 10/11, and 11/12 October. Airfields, especially Frosinone, where 100 enemy planes had been sighted on the 9th, road junctions, and marshaling yards were the main targets. "Such night attacks were especially

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important at this stage of the campaign, for the enemy's main movements were of necessity made at night, and the bombers' value in disorganizing transport schedules and inflicting material damage made their efforts of importance out of all proportion to the scale of their efforts." While estimation of bomb damage at night was always a problem, on the night of 14 October 1943, a combined Wellington-Mitchell attack on the towns of Battipaglia and Eboli in support of the Salerno landings achieved such concentration that the towns were practically destroyed. ²¹

Air superiority in Italy came to the Allies as soon as airfields in the southern part of the Peninsula had been reconditioned and occupied. As a result, after the crisis had passed at Salerno, night missions were no longer a necessity. Moreover, the experienced 12th Group was withdrawn from Italy and assigned to the Tenth Air Force. RAF Wellingtons continued to bomb at night, but American units busied themselves with daylight missions almost entirely. There were some exceptions to this general rule. The 47th Bombardment Group, which used its A-20's and A-26's as an intruder force during the last year of the war, sometimes bombed under ground radar control when weather interfered with communications targets or when targets of opportunity could not be found. The preinvasion bombing of Southern France required night takeoff and assembly so that heavy bombers could reach their assigned targets at the scheduled time. Also, toward the end of the war, single heavy bombers from Italy sometimes bombed cities in Austria and Germany at night by radar while out on weather reconnaissance.

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It is nonetheless true that after Salerno there was no planned night bombing offensive by American planes operating from Italian bases.²²

The first year in the Pacific. Daylight precision bombing doctrine could be upheld in Europe so long as operations were in the planning stage, and by the time plans were converted into reality the planes necessary for a daylight offensive were available. In the Pacific, where the AAF was reeling under the blows of superior Japanese airpower through most of 1942, the only question was how to strike back without prohibitive losses. Night missions proved to be one answer ~~to this question.~~ Therefore, while a massive daylight assault upon Germany was being planned, desperate, small-scale night blows were being struck in the Pacific. The early night missions flown by the AAF during World War II were a matter of necessity rather than choice.

It was fortunate that General Brereton's program in the Philippines before the outbreak of war required that 40 percent of all flight training should "include night operations." Driven back from the Philippines, ousted from Java, Brereton's B-17's were far too few to contest the command of daylight air. Day missions brought such high losses that night missions were essential to hoard the slight bomber strength available. It must be added that, except for harassment, the effectiveness of these early missions was doubtful, though an attack on a Japanese convoy east of Makassar on the night of 12/13 February 1942 resulted in claims of direct hits on a cruiser and carrier from 2,000 feet.²³

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When Brereton's few planes flew from Java to India, the same policy was continued. Before the onset of the rainy season, several night missions were launched against Rangoon and adjacent Mingaladon airdrome, and on the night of 2 April Brereton himself led a strike against shipping in the Andaman Islands and claimed a direct hit on a cruiser. Practically all bombing ceased during the rains, but in November 1942 Bangkok, Port Blair, and Rangoon were bombed by B-17's in squadron strength. In China six B-25's of the 11th Bombardment Squadron successfully struck the North Point Power Station at Hong Kong by moonlight on the night of 25 October 1942.²⁴

~~Like~~ ~~wise~~, during 1942, night missions were frequently flown in the South and Southwest Pacific. Rabaul, which the Japanese were turning into a powerful base of operations, was the target for numerous sorties of B-25's and B-26's which were staged through Port Moresby from Australia. This proved too long a haul for the medium bombers, and in May 1942 the heavies were given responsibility for Rabaul. By autumn 1942 Fifth Air Force B-17's were being led into New Britain at night by RAAF (Royal Australian Air Force) Catalinas which marked the target with incendiary bombs or flares. Sometimes, after a medium-altitude bomb run, the B-17's returned at low level, attempting to shoot up anti-aircraft positions and searchlights. If the bombers could do nothing else, they could harass the Japanese defenders. On the night of 6 December, for example, two B-17's of the 63rd Bombardment Squadron hovered over Lakunai Airdrome at Rabaul, dropping an assortment of flares, incendiaries, and fragmentation clusters.²⁵

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The capture of Henderson Field⁷ on Guadalcanal⁷ and the building of other strips there provided forward bases from which heavy bombers could operate. The 11th Bombardment Group began staging through Guadalcanal in September 1942, and the 5th Group followed suit shortly. From Guadalcanal B-17's and PB4Y's flew up to Munda and remained overhead for three or four hours, dropping bombs every quarter hour, "alternating with mortar shells and with beer bottles, which added their eerie wail as they fell."²⁶

The accomplishments of night bombers during the first year of the war in the Pacific were not impressive. More important than the damage done to the enemy was the experience gained. Because of this experience, ^{AIF} ~~Air~~ Force units were much more able to deal with the weather and navigational difficulties they were to encounter in the Pacific during the remainder of the war. This experience was gained at considerable cost, however; one group, the 11th, lost 21 planes between 31 July and 30 November 1942. It is significant that six of these planes went down at sea as a result of becoming lost at night in bad weather. Moreover, "Long night missions produced extreme eye strain, with a rapid development of fatigue, and crews of more than sixteen months service were beyond restoration when held in combat longer than the normal six-week period."²⁷

It was fortunate that the Japanese lacked radar,⁸ equipped night fighters,⁹ and that enemy day fighters, ¹⁰ seldom ~~proved~~ aggressive at night, because the exhaust flame of American bombers made them easy to locate in the air. The B-25's which raided Hong Kong on the night of 25 October 1942 "were

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attacked by night fighters, which they successfully evaded, though the light from their exhausts enabled enemy planes to follow them more than a hundred miles." A pilot of the 19th Group, Lt. Col. John A. Rouse, noted in regard to fighters which attacked his squadron after a dusk raid on Koepang Airdrome: "Couldn't see them it was so dark. They could see our exhaust and also see us silouheded [sic] against the dark sky behind. Stayed with us about 20 minutes."²⁸

The fact that losses were high and the strain great on night missions did not lead many crews to prefer day bombing. ~~They had quickly learned that unescorted bombers could not stand up to strong fighter opposition.~~

The strain and losses on night missions could be borne because the crews well knew that their loss rate would be higher if long ^{was the} missions were flown during daylight. Colonel Rouse expressed this attitude in his diary:

"Mission came through. Three planes from our squadron are going to Batchelor . . . and then bomb Kendari. Hope and expect it is a night mission."²⁹

The bombing of Bougainville. By early 1943 the Thirteenth Air Force could begin reduction of the most powerful Japanese bases in the Solomons, those airfields located on Bougainville. Facilities on Guadalcanal were too primitive to permit the operation of more than a few bombers at a time, however, and had the facilities been adequate, more bombers were not available. Since large formations could not be sent out, and since the targets on Bougainville were heavily defended, most of the missions from

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Guadalcanal were at night. Kahili Airdrome was the most frequently bombed target, though Ballale, Buin, and Buka were not neglected.

There was one attempt at daylight operations against Bougainville in early 1943 as 15 Thirteenth Air Force planes struck at objectives in the Shortland Harbor area. Enemy fighters swarmed over the attackers, and a third of the sorties sent out failed to return. The 307th Group lost three of the six planes it flew on this mission. After this debacle, night bombing was the rule until fighter cover could be provided over Bougainville. There was no successful daylight attack on Kahili until July 1943.³⁰

The predominance of night bombing during April and May is evident from the record of the 394th Squadron of the 5th Bombardment Group. During the two-month period this unit flew only ~~two~~² day missions, but went out at night 11 times. Altogether, 42 sorties were flown, and all were directed against Bougainville targets, with Kahili and Shortland Harbor receiving more attention than any other enemy positions.³¹

Flares were used during some of these attacks, with each bomber carrying six M-26 parachute flares in addition to its bombs. "Following closely worked out time tables each ship was able to bomb by light from the flares released by a sister ship and in return release for the . . . [next] ship." The same trouble with the M-26 flare was encountered in the Solomons that was met with elsewhere in World War II and in the first two years of the Korean War. The 307th Group noted during April 1943 that at least 75 out of the 200 flares released failed to ignite.³²

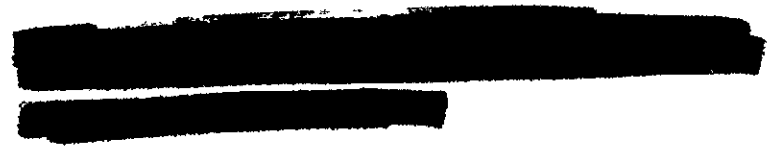




The heavy bombers of the Thirteenth Air Force made some attempts at formation bombing at night during the spring of 1943, and also experimented with the use of the Norden bombsight at night. The bombardiers of the 307th Group successfully used the bombsight at 12,000 feet, and they felt that it could be used from as high as 15,000 feet in bright moonlight when no haze was present. On 14 May this same group attempted formation bombing at night from 20,000 feet. Formation was maintained to the initial point, but weather over the target necessitated individual bomb runs. Experiments in night formation bombing were continued, and the 72nd Bombardment Squadron reported good results from this type of attack in June 1943.³³

One June mission demonstrated the difficulties encountered during operations from Guadalcanal and in navigating the vast reaches of the Pacific from any base. A carefully coordinated mission against Nauru Island had been planned in cooperation with the Seventh Air Force. The 307th Group had intended to send 23 bombers on this mission, scheduled for 15 June. "Due to the poor condition of Carney Field (dust taking eight minutes to settle between takeoffs) only 12 planes with reduced gas and bomb loads were able to take off. These flew individual, instead of the planned formation missions, and only six were able to pick the tiny target out of the clouds obscuring the area."³⁴

During July night attacks on Kahili and other Bougainville airfields were stepped up to a higher pitch. This was partly an attempt to beat down growing Japanese opposition, partly preparation for a large-scale, fighter-escorted,



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day mission planned for the end of the month. These night missions resulted in some losses; the 307th Group had one bomber shot down by a night fighter, one lost to navigational error, and two which failed to return for unknown reasons.³⁵

With the capture of Munda Airfield on New Georgia island in early August 1943 and the development of Barakoma Strip on Vella Lavella by October, the Japanese bases on Bougainville were brought too close to Allied bases to survive as centers of Japanese air power. Bombers of the Thirteenth Air Force, escorted by fighters from Munda, were soon able to operate over Bougainville in daylight, and in January 1944 heavy bombers themselves moved into Munda.³⁶

The night air offensive against Rabaul. In the meantime, the Fifth Air Force had been delivering blows westward along the coast of New Guinea, while it continued to fly north against Rabaul. The blows against the New Britain base, designed to prevent the Japanese from reinforcing their troops on New Guinea and Guadalcanal, had become routine by the autumn of 1942, though the effort was light when measured in the number of sorties and weight of bombs dropped. By October, however, the 19th and 43rd Bombardment Groups were able to put 15 or more B-17's over Rabaul on successive nights. The more experienced 19th Group acted as a pathfinder unit on these missions, dropping flares to illuminate aiming points for the newer crews.

Also in October the 63rd Bombardment Squadron of the 43rd Group utilized the tactic of skip bombing, which the unit had developed, to hit

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shipping targets at Rabaul. During the bright moon ~~period~~ of 22/23 October, planes of this unit enjoyed unusual success. "Green hit a 5,000 ton cargo ship outside the harbor, a 250' cruiser off Matupi Point at 250' and put two hits on a 15,000 ton cargo in the harbor from 5,000 feet setting the boat on fire. It burned for hours and could be seen 80 miles away. McCullar hit a destroyer from 250' sinking it. Hustad laid his bombs right alongside a 10,000 ton cargo in the harbor . . ." On the next night, "Anderson salvoed bombs around a 15,000 ton cargo in harbor. Hustad blew up a gunboat to bits [sic] that was shooting all over. Wilson hit a 5,000 ton cargo ship skip bombing. . . . Green overshot on last bomb which set a huge fire going on coaling jetty." It must be pointed out that the claims of sinkings on these two missions were in error, since no ships were sunk on these dates. Considering the altitude of attack and the testimony of the crews, however, it may safely be presumed that a number of hits were made.³⁷

In late 1942, ^{11.2} General George C. Kenney was informed that the B-24 would replace the B-17 for all heavy bombardment units in the Pacific. The Fifth Air Force commander had doubts about the Liberator ~~number~~ at first, since it was not so strong defensively as the Flying Fortress, and planned to use it only at night. The 90th Bombardment Group, which replaced the 19th, was the first B-24 organization to arrive in the Southwest Pacific. No particular fault was found with the planes, though they were considerably modified, but the training status of the crews was not far enough advanced for night missions in New Guinea. Therefore the group was taken from combat and

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put on training status "until they had learned more about night flying and navigation and had done some practice bombing and gunnery." Some use for the planes and crews was found; they flew daylight reconnaissance missions during the training period.³⁸

On New Year's night, 1943, a formation of 43rd Group B-17's used flares, dropped by the lead plane, in order to bomb Lakunai Airfield on New Britain. The 63rd Squadron alone put six missions over Rabaul in January, amounting to 30 sorties. In addition to single-plane reconnaissance missions, which often dropped bombs on New Britain targets before coming home, the Fifth Air Force had heavy bombers over Rabaul on 13 nights during January. Weather, searchlights, and anti-aircraft fire made it very difficult to estimate the results but when land targets were bombed, fires were usually started, and attacks on shipping in the harbor were believed to be fruitful.³⁹

General Kenney gave his reasons for night bombing in a letter to General Arnold, 23 January 1943. Pointing out his limited scale of activities, Kenney went on: "To be in a position to deliver even this small effort, I have found it necessary to omit day bombing except in an emergency, due to the fact that daylight operations do put many more planes out of commission than the night missions." The same scale of effort was continued in February, and again Rabaul was the chief target, though there were some missions over Buin in the South Pacific Area. Heavy bombers were over Rabaul half the nights in February, sometimes singly, more often in flights of six.⁴⁰

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Some indication of the damage which might be done to enemy installations by night attack was given in the diary of a Japanese soldier who had been at Rabaul. This man noted, in an entry dated 5 February 1943: "During the stay in Rabaul there was a raid every night . . . During one raid two Japanese fighters and one bomber were destroyed. On another occasion between February 5 and 10, a single bomber (Fortress) glided in with engines cut at very low altitude and bombed a line of fighters on Lakunai Strip. Several caught fire and, aided by the wind, 30 or 31 fighters and 3 bombers were destroyed." General Kenney believed that the night missions brought worth-while results. After a raid on the Rabaul airdromes on the night of 10/11 May 1943, he noted that "The next morning the photos showed plenty of wrecks and burnt-out aircraft in the revetted dispersal bays."⁴¹

*insufficient
to
force*

Insofar as ~~night flying~~ was concerned, March was not a particularly active month for ~~the~~ Fifth Air Force. The major effort put forth in the Battle of the Bismarck Sea left the organization so exhausted that for the remainder of the spring there was little more activity, night or day, than there had been in the autumn of 1942. Even so, in addition to blows against Wewak and Kavieng, there were 17 multiple-sortie missions against Rabaul during March, April, and May, amounting to about 130 sorties. Bombs with time fuses set to explode 300 feet above the ground were used on some of these missions, and it was noted that these air bursts temporarily silenced antiaircraft batteries and put out searchlights. In addition to land targets, the ubiquitous 63rd Squadron made night attacks on shipping in Japanese-





held harbors. Good results were claimed at Kavieng and Wewak in April, though the claim of one ship definitely sunk at Wewak on 19 April was erroneous. The Japanese were becoming aware of the danger from skip-bombing attacks, however, and were using their searchlights and anti-aircraft guns more effectively.⁴²

The bombing of Rabaul continued through the summer, with ~~eight~~⁷ missions, averaging 15 planes each, going out at night in June. The number of sorties declined to 92 in July, and it was probably still lower in August and September, because the main effort of the Fifth Air Force was concentrated upon New Guinea targets. Enemy resistance over New Britain was becoming stronger, and the 63rd Squadron was intercepted at night several times during June. On one occasion a Japanese fighter working in cooperation with searchlights shot up a B-17 and seriously wounded one of the gunners. Another Fortress, intercepted over Rabaul on the night of 12 April, escaped by diving out at 310 miles per hour. The Fifth Air Force lost seven heavy bombers between May and September, but none of these was definitely credited to night fighters.⁴³

While night effort over Rabaul decreased somewhat in July, several new targets were brought under attack. From its bases in western Australia, the 380th Bombardment Group began a series of truly strategic night strikes against oil targets in the Dutch East Indies. On 22 July six B-24's of the 528th Bombardment Squadron dropped 646 incendiaries and 36 quarter-ton demolition bombs upon industrial installations at Soerabaja, Java. No



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Liberators failed to return from the 14-hour, 2,400-mile flight. During August two missions of nine planes each were sent against Balikpapan, and excellent results were reported by the returning crews.

After following reports were made by crews returning from the 14 August strike against oil refineries at Balikpapan, a reconnaissance mission was sent out, and it was revealed that the refineries were still in full operation.

This pointed up the difficulty in assessing the results of night missions.


^{Because} Night aerial photography was still in its infancy, and no photographs of the bomb strikes could be taken, ^A it was necessary to depend almost entirely upon the observations of the bomber crews. ^{Since} Since each plane ordinarily bombed individually, a crew could report only on its own bombs. Whatever the target, the report was usually that the bombs "had hit the target area and that large fires and explosions had resulted." It is interesting, though profitless, to speculate as to whether night bombing would have been encouraged or discarded, except for harassment purposes, if accurate evaluation of the results had been possible. ⁴⁴

Except for harassing attacks, Fifth Air Force bombers operated more in daylight than in darkness during the last quarter of 1943. When South Pacific forces began the reduction of Bougainville, it was planned that nightly attacks on Buka and Kavieng should give support, but Admiral Halsey asked instead that Rabaul be kept under attack. This request was honored, but the main Fifth Air Force effort against this familiar target was to be in daylight ^{henceforth} ~~henceforth~~. The autumn weather had much to do with this decision!

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Brigadier General Ennis Whitehead, commander of the Advanced Echelon, Fifth Air Force, believed that night missions against Buka, Kavieng, and Rabaul at this time would result in a 15⁺30 percent loss to weather. It should be mentioned, however, that night missions had been flown during the last months of 1942 without such excessive losses. Be that as it may, except for harassment, only one night attack was mounted on Rabaul during October and November.⁴⁵

Fifth Air Force night attacks had failed to neutralize Rabaul, but it should be noted that the day attacks of the autumn also failed to accomplish this objective. After November, Rabaul became the responsibility of the Thirteenth Air Force. Some harassment by planes of the Fifth Air Force continued after November, but these missions were left more and more in the hands of RAAF Beauforts and Catalinas.⁴⁶

When responsibility for the neutralization of Rabaul was given to the Thirteenth Air Force, Major General Millard F. Harmon, Commanding General, South Pacific, decided that heavy bombers should operate over the New Britain stronghold at night, in view of high losses on daylight missions. The first such mission was flown on the night of 10/11 January 1944, and 11 more were put over New Britain during the next ~~two~~^{two} weeks, ranging from ~~eight~~^{eight} to 39 bombers to the mission. These attacks were of the usual type, by individual planes from an altitude of 5,000 to 15,000 feet at five¹/₂ to ten-minute intervals. Flares were used on some nights. ~~Insofar as material damage was concerned,~~ the effectiveness of these missions was doubtful.³



^{and} many of the bombers which set out turned back because of weather or mechanical malfunctions. Perhaps the harassing effect alone was worth the effort. It was not long before "A standard schedule of morning, afternoon, and night missions gave Rabaul's defenders little respite except when weather interfered."⁴⁷

By this stage of the war, a more or less consistent pattern of action for the neutralization of distant and strongly defended enemy bases had evolved. Attacks on such bases began with small-scale night raids, soon followed by full-scale day bombing. The first day bombing effort often brought forth too vigorous a reaction from the enemy, and when this happened, the heavies reverted to night bombing. While these night attacks were going on, amphibious advances opened forward landing fields ~~from~~ whence medium bombers could reach the base to be neutralized, and from which fighters could escort heavy bombers. Once the forward bases had been obtained, the target could be battered into passivity by high- and medium-altitude bombing, and by low-altitude bombing and strafing. The enemy base might still bristle with troops and anti-aircraft guns, but it could no longer serve as a base for offensive action. Rabaul was going through this ordeal in early 1944.

It is interesting to note how this pattern appears in the January operations of the 394th Bombardment Squadron of the 5th Group. This unit flew ⁸ ~~eight~~ missions, including ⁴ ~~four~~ night missions of 28 sorties directed against the Rabaul area. Among the targets for day missions were Kahili, Kavieng,



Buka, and Bonis Airbases, bases which had once been so strong and distant that they were bombed only at night. The last two missions of the month were also full-scale day efforts, and, significantly, they were directed against Rabaul. The air offensive had finally beaten this New Britain bastion down until it was no longer a threat to Allied advances so long as it was not attacked from the ground. It was still to be the recipient of many bombs, but further bombing, including night harassing attacks, were merely to keep it beaten down.⁴⁸

Night bombing in the drive to the Philippines. During August the heavy bombers of the Fifth Air Force flew a highly important mission against the airdromes in the Wewak area of New Guinea. Twelve B-17's and 38 B-24's took to the air from Port Moresby before midnight. Except for two abortive B-24's, all were over the targets before 0300 of 17 August. Dagua, But, Boram, and Wewak Airfields were hit with incendiaries and fragmentation bombs, though the plan to drop incendiaries first so that fires might serve as aiming points went awry when timing became confused. Of 204 Japanese aircraft on the fields attacked, 18 were unserviceable after the bombing, but there can be no certainty that some of them were not out of commission before the attack. The number of enemy aircraft destroyed was not particularly important, however, because the purpose of the attack "had been to keep the Nip aircraft grounded and at the mercy of a morning B-25 strike, and this was accomplished."⁴⁹

After responsibility for Rabaul was turned over to the Thirteenth Air



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Force, General Kenney's Fifth Air Force planes turned to targets more directly related to the campaign in New Guinea. Most of these missions were flown in daylight, but it should be noted that the example set at Wewak was followed during the Finschhafen landings, when 21 B-24's began bombing the Japanese airfields on Cape Gloucester at 0300, holding the enemy planes on the ground so as to put them at the mercy of a dawn attack by B-25's. The air action in connection with the New Britain invasion of December 1943 included some night work. "Daylight attacks were followed by nightly harassing during which B-24's dribbled grenades and beer bottles over the bivouac areas to keep the enemy under continual blackout and mental strain."⁵⁰

While not adequate for firm conclusions, Fifth Air Force loss figures for 1943 were worth consideration. During the first nine months of the year, when most heavy bomber missions were at night, the loss rate ranged from 4 percent of the planes on hand in February to 15 percent in April, with an overall average of 8 percent. During October, November, and December the highest loss, 9 percent of the heavy bombers on hand, came in October, when heavy daylight raids on Rabaul were in progress. The average loss for the three months was 6 percent. It must be remembered that these were percentages of the heavy bombers on hand, not of the sorties flown. The average number of planes on hand was only 130 during the first nine months, but it was 241 for the remainder of the year. The average number of planes lost a month from January through September was 11; from October through

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December the average monthly loss was 16. It may also be recorded that planes of three squadrons of the 43rd Bombardment Group, through April 1943, had flown a total of 1,186 sorties with a loss of only 14 bombers, only 1.1 percent of the sorties flown. The 63rd Squadron of this group, which flew an even 500 of the sorties listed, lost only three planes, amounting to 0.6 percent of its sorties. Since the 43rd Group was more experienced than other Fifth Air Force groups at this time, and since the 63rd Squadron flew so many more missions than any other squadron of the group during the night flying period of 1942 and 1943, it is obvious that added experience reduced the cost of night missions considerably. ⁵¹

During 1944 and 1945 bombers of the Fifth Air Force engaged in four kinds of night missions. The 380th Bombardment Group made a number of strategic attacks upon East Indies targets and several night tactical attacks in the Celebes. Preinvasion bombing by this and other units struck Hollandia's airdromes, and Wakde Island, and then Biak. In late 1944 and early 1945, night raids were mounted upon Japanese airfields within range of Morotai in an attempt to reduce enemy pressure upon that base. Lastly, bombers of the 63rd Squadron carried out harassing raids upon enemy bases throughout the period. These Fifth Air Force night bombing sorties were supplemented by the night activities of the Thirteenth Air Force, the 868th Squadron in particular.

The 380th Group, having begun bombing East Indies targets at night in 1943, continued this type of night mission after the beginning of the new year.

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Balikpapan suffered on the night of 12/13 January; Ambon, Namlea, and Halong were all bombed at night during February; and a reportedly successful mission was sent against Soerabaja in March. The conclusion does not follow that this group was engaged primarily in night bombing; on the contrary, night sorties were only half as numerous as ~~day sorties~~. During February and March the 531st Squadron flew 85 sorties, of which 56 were in daylight. Only 34 of the 111 sorties flown by the 528th Squadron during the same period were at night. ⁵²

On a reduced scale, the 380th Group continued to run night missions through the remainder of 1944. On 17 May a British carrier strike left the waterfront at Soerabaja in flames, and seven B-24's took advantage of the illumination thus afforded for a night mission. The remaining night missions were a repetition of those which had gone before, with fires or unobserved results. For all practical purposes, the 380th Group closed its night bombing activities in the autumn of 1944. ⁵³

On the whole, the 380th Group obtained much better results by day than by night. Photographs reveal the quality of day bombing as good, while crew reports indicate that results at night, with some exceptions, were disappointing. The crews who flew these planes were not primarily trained for night work, and they were flying both night and day. Furthermore, in addition to the normal difficulties of night bombing, many of the night missions of the 380th Group had the added handicap of operations near extreme range. ⁵⁴

By the spring of 1944, General Douglas MacArthur's forces in New

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Guinea were ready to make a great leap to the west and seize Hollandia and Aitape. Preinvasion bombing of Hollandia proved a difficult problem, since the distance was too great to permit fighter escort without special fuel tanks. Nadzab, the best Allied base in most respects, was unsuitable for night takeoffs and landings because of the surrounding terrain. For this reason, the planes which attacked Hollandia had to be staged through Saidor, where the field left much to be desired. To make matters worse, the airfields at Hollandia were inland, and thus hard to find at night. Lastly, but perhaps most important of all, the weather was bad during March and April, multiplying the hazards and obstacles imposed by the other conditions. As General Kenney had expected, the night bombing of Hollandia was unsuccessful ~~insofar as destruction of enemy aircraft and installations was concerned.~~ Despite his expectations, the Fifth Air Force commander had ordered the night effort, because he wanted the Japanese to believe that Hollandia was too far away for fighter escort to be provided under any circumstances. When the time was ripe, a full-scale day attack was launched, and the fields were neutralized. It should be noted that B-24's were over Hollandia at night 29/30 March, holding Japanese planes on the ground until a day mission could dispose of them.⁵⁵

West of Hollandia lay Wakde, which Allied planners envisaged as a base for attacks west to the Indies and north to the Philippines. Night raids on Wakde were very successful, in contrast to the bombing of Hollandia. Presumably this resulted from the fact that "Wakde was only a small island easily





identified by radar and so jammed with military objectives that a hit anywhere would be damaging." The Japanese themselves attested to the effectiveness of the bombing. One strike, 6 April 1944, according to a captured diary, "killed eleven men, destroyed a barracks, cratered the runway in five places, and destroyed or severely damaged ten planes." During April the 63rd Squadron had a total of 39 sorties over Wakde on eight different nights. As was true of other doomed Japanese bases, a large-scale night effort was mounted 27/28 April in order to hold aircraft on the ground until they could be hit by day.⁵⁶

Biak, in the Schouten ^{Islands} Group, was the next step toward the Philippines. The 63rd and 868th Squadrons, equipped with radar, subjected enemy installations on this island to almost constant night pounding during the first 28 days of May 1944, sending out some 132 sorties. Much of this bombing was carried out by one or two planes returning from sea-search missions where no targets had been located, but several full-scale squadron missions were flown.⁵⁷

Morotai Island, in the ^{Moluccas} ~~Halmaheras~~, was invaded by Allied troops in mid-September 1944, and Allied planes from this base were soon ranging ever farther to the north into the Philippines. But because it was located in the midst of encircling Japanese bases, Morotai was peculiarly exposed to air attack, and as Allied strength on the island grew, it became a more and more ^vregarding target. Night fighters and antiaircraft were unable to check Japanese bombing, and on several nights the raids did major damage.



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Because of this state of affairs, from September on into January Allied bombers devoted a great deal of attention to the airfields, mainly in the Celebes, ~~from~~ whence the raiders came.

The 63rd and 868th Squadrons devoted bombs left over from sea searches to Japanese airfields, and ran some special night missions against stores areas used in supplying the airfields. In November these units began concentrating on airfields in the Philippines, and the 38th Bombardment Group, flying B-25's, was abruptly converted to night operations in order that it might attend to the nearer targets. The story is best told in the words of the group's historian:⁵⁸

At this point . . . the group was called upon to undertake a type of mission with which most of the personnel were unfamiliar. Enemy aircraft had been raiding this base [Morotai] almost nightly, and inflicting considerable damage to grounded airplanes. In an effort to stop or at least minimize this activity, the 38th was assigned the task of heckling enemy airdromes on Mindanao, the Halmaheras, and the Celebes at night. Every serviceable airfield within striking distance was to be covered for as long as possible. So, on the sixteenth of November, fourteen airplanes spent the moonlight hours leisurely dropping one hundred pounders on a total of twenty-four airdromes. This procedure was continued throughout the remaining nights of the month, with a varying number of aircraft, as was the enemy's interest in Morotai. The effectiveness of the raids was, to say the least, dubious. Actual results were rarely ascertained, usually because there were none. Adding to that was the fact that occasional "conditions red" were caused by returning airplanes, so it remains a toss-up as to whether more was accomplished by sending the airplanes out or by keeping them on the ground.

Throughout the remainder of the war the 63rd and 868th Squadrons, using their SB-24's, made harassing attacks on Japanese air bases. Most of this bombing came about when a search for shipping failed. Airfields in

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the Philippines, the Palaus, and on Yap Island were frequently harassed, and the 868th Squadron struck Woleai Island and East Indies targets. After its part in the neutralization of Truk, which will be discussed in connection with the Central Pacific campaign, the Thirteenth Air Force began full-scale day strikes against East Indies targets, but the distances covered were so great that it was necessary that takeoffs be made before dawn. So much night navigation was necessary, in fact, that ~~it became necessary to~~ institute a training program ^{for night navigation.}

After Allied bases were established in the Philippines, night sorties could be sent against Formosa. The 63rd Squadron, flying ~~in conjunction~~ with the 90th Group, flew 131 sorties against Formosa during January 1945 with exceptionally good results. On the night of 23/24 January direct hits were scored on the Nippon Aluminum Company factory at Takao with 500-lb. incendiary bombs. From two to seven planes flew per mission, and bombing was accomplished despite opposition from searchlights, antiaircraft fire, and night fighters. The weight of these night bombing attacks was lessened in February, when the 63rd Squadron returned to sea-search duties, but even then the SB-24's struck targets on Formosa, Hainan Island, the Pescadores, and the Japanese-occupied portions of the Philippines when no shipping was found. In the spring, targets were often found along the coast of China. It might be noted that the SB-24's began using 550-gallon drums of napalm against land targets in May 1945, and the crews of the 63rd Squadron thought this type bomb the best incendiary yet used for night work. ⁶⁰

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The SB-24-equipped 868th Squadron made three experimental strikes against Japanese harbors in Java in the spring of 1945. The first of these, 24/25 April 1945, involved ^{a plane} sending one plane over Soerabaja Harbor to drop window and jam defensive radar with electronic equipment while another ^{was to} drop napalm bombs in the naval basin to provide illumination for a third ship's low-level attack on a destroyer known to be tied up at the wharf. In the event, the effectiveness of the defenses was much reduced by the window and jamming, but a rack malfunction prevented the second plane's carrying out its part of the plan. The third bomber, aiming blind, overshot the target, but the bomb did strike in a warehouse area where it started large fires.

Seven bombers were scheduled for a mission against shipping in the same harbor, the night of 27 April. This time the second plane, after the leader had jammed the radar defenses, was to use radar to drop flares from high altitude. ~~Another malfunction, this time of radar equipment, ensued,~~ ^{then} and the flares were dropped visually and inaccurately. "The Snooper aircraft bombed as briefed, but as the flares did not drop or illuminate as planned, the target could not be seen visually and the exact location of the bomb bursts were [sic] unobserved."

On 4 June ^Y a seven-plane attack was delivered upon shipping and the seaplane base at Batavia. "The tactics called for four aircraft to bomb from medium altitude with an additional mission to distract defenses and cover three aircraft, bombing shipping at low altitude." Radar malfunctions

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prevented two of the low-altitude attackers from bombing shipping, so they made bomb runs on the Naval Basin; the third low-altitude bomber claimed to have damaged ~~a probable DD~~ ^Q ~~destroyer~~ ³. "The results of bombing the Naval Basin were not known; "The night was pitch black and results other than bomb bursts were unobserved." It is noteworthy that this mission involved more than 3,000 miles of flying, and that the planes averaged 18 hours and 15 minutes in the air. The Japanese had presumably thought Batavia safe from attack, because the lights in the city remained on through the raid. ⁶¹

Night bombing in the Central Pacific. The Seventh Air Force, originally known as the Hawaiian Air Force, sent units to take part in the Guadalcanal campaign and ~~took part~~ ^{was in it} in the Battle of Midway in 1942, but most of its energies in the first year of the war were taken up with defensive patrols. These patrols, and two night missions against Wake Island revealed that the navigators in the heavy bomber crews were not adequately trained in dead reckoning procedures. Many planes became lost and had to be brought home by radio. This situation, believed to result from the fact that the Pan American navigation school at Coral Gables, Florida, emphasized radio and celestial navigation, was corrected by a training program and by careful checking of navigators' logs when they returned from missions. ⁶²

In the late spring of 1943, the Seventh Air Force began the task of softening up the Gilbert Islands for invasion. While enemy interception was usually encountered over the Gilberts, it was not in such strength that a formation

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of 12 B-24's could not defend itself, so most bombing was done in daylight. A few night missions were flown, however, and two Liberators which struck Tarawa on the night of 17/18 June did damage out of all proportion to their numbers, knocking out 2,500 feet of runway, blowing up an ammunition dump, and silencing an anti-aircraft position. Another mission employed photo-flash bulbs in a night reconnaissance over Mille and Jaluit. The familiar tactic of holding enemy planes on the ground by night bombing was used at Tarawa the night of 17/18 September when 18 B-24's went over the atoll in preparation for a carrier plane strike scheduled for ~~the~~ dawn.

Some note should be taken of a mission the night of 28 June 1943, a mission which might be considered one of the most unsuccessful of the war. Twenty planes set out for Funafuti, ~~from~~ whence a strike against Nauru was to be flown, but one crashed at Palmyra, along the way. Of the remaining 19, two had engine trouble at Funafuti and were unable to take off. The first plane which did leave the runway crashed, the next six managed to get into the air, then the eighth plane crashed. No more takeoffs were made. Of the six planes airborne, four started toward the target, but only two were able to locate Nauru in the prevailing bad weather, and these two were unable to observe the results of their bombing.⁶³

As soon as the Gilberts were secure, the Marshall Islands became targets for Seventh Air Force B-24's. The interception encountered over the Marshalls was much more severe than anything yet encountered in the Central Pacific. Over Maloelap Airfield Japanese fighters contested the air on every

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mission from 16 November 1943 to 2 January 1944, destroying 11 B-24's and damaging 60. Such losses were too heavy, and in January night bombing became the policy. Experiments were made in bombing by moonlight, and it was found that the white runways of coral atolls were easily seen by bombardiers. "[Night] missions were found to be more successful than daylight missions from the point of view of good bombing results and safety to personnel and planes."⁶⁴

Through January and until 3 February 1944, which was D-Day at Kwajalein, B-24's were over Kwajalein, Wotje, and Maloelap part of practically every night. From D minus 3 until D-Day, at least one plane was over these targets at all times from dusk to dawn. Most of the bombs dropped were 500-pounders with delay fuses, released a few at a time. "By this tactic the enemy was prevented from repairing the runways and denied opportunity to sleep." In addition to the actual damage to installations and personnel caused by these harassing attacks, an AAF Evaluation Board felt that they made a further contribution "in wearing down defending troops, causing them to lose sleep and hence making them less alert. Moreover, the effect of the widespread strikes was to confuse the enemy as to the incidence of the next amphibious attack and divide his attention."⁶⁵

The bastion of Truk, in the Caroline Islands, was probably the strongest Japanese position in the Pacific. The aerial offensive against Truk could not follow the same pattern as that against enemy bases in the Solomons, New Guinea, New Britain, and the Marshall Islands, because neither line of

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American advance toward Japan, whether by way of the Philippines or directly across the Central Pacific, passed near the Carolines. Truk was within range of B-24's from the South Pacific or from the Marshall Islands, but there could be no hope of fighter escort, nor could the enemy fighter force be decimated by B-25 parafrag and strafing attacks. Truk was to be the prey of the B-24's alone, except for carrier plane attacks, for the remainder of the war.

The offensive against Truk was begun in March 1944 with daylight missions by the 5th and 307th Groups of the Thirteenth Air Force. The 868th Squadron, with its radar-equipped SB-24 "Snoopers," served as a pathfinder force on these long flights. As was usually the case with the first daylight attacks on strongly defended bases, losses were heavy. With this example before it, the Seventh Air Force attempted no day missions at this time. On the night of 14/15 March, however, 22 B-24's took off from Kwajalein for Eten Airdrome and the Dublon Seaplane Base and Tank Farm. Because of bad weather, nine of these planes turned back or bombed alternate targets, but 13 went on to Truk. The Japanese made target identification easy by leaving their radio station on the air, so the bombers simply rode in on the beam. The results of the bombing were believed to be good, since great explosions rocked the target areas. Other Seventh Air Force missions against Truk in March, all at night, brought the total number of sorties up to 70. ⁶⁶

At the end of March 1943, the Thirteenth Air Force began night raids

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against Truk, and such attacks came frequently during April. When no large-scale raids were going on, 868th Squadron hecklers ranged over the Carolines. These radar-equipped SB-24's also served as pathfinders for other Thirteenth Air Force planes. The unit lost two aircraft during the month of April, and another was seriously damaged when it proved impossible to turn out the rudder light and fighters attacked. Five large-scale missions went against Truk from the South Pacific during April, and in addition a two-group strike was made against Woleai in the western Carolines on the night of 18/19 April.⁶⁷

The 11th and 30th Groups of the Seventh Air Force also pounded targets in the Truk area during April, and all of the 15 missions flown against these objectives, totaling some 250 sorties, were during the hours of darkness. While these night missions were in progress, new crews were getting training in night bombing by flying sorties against islands still held by the Japanese in the Marshall group. Day strikes against other targets were made during the same period, but most sorties went against the Carolines. The 11th Group was almost a night bombing unit, flying 173 sorties at night and only 45 during the day. The 30th Group did not go to this extreme, but most of its missions were at night nonetheless.

As usual, evaluating the results of night bombing proved a frustrating task. Fires were reported on the night of 1 April, fires and explosions on the night of the 10th, 98 percent hits on the night of the 4th, and 67 percent hits on the night of the 16th. More often, however, results were unobserved,



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or it was merely stated that most of the bombs were seen to hit on land. Photographs were attempted on several missions, but gave little indication of bombing results. If the mission reports and unit histories are reliable, the results of night bombing at Truk were as good or better than the results at Wake Island and other targets bombed by day. It should also be mentioned that Ponape, used as an alternate by planes unable to complete the flight to Truk, took a heavy pounding through April and the succeeding months.

Bombing runs were made individually. Usually evasive action was taken for 30 minutes or so on the approach to the initial point, and for an equal time when withdrawing from the target. The Japanese had radar at Truk, but apparently window was not used until May. Searchlights and anti-aircraft guns gave a great deal of trouble over the target, and fighters were usually seen to be airborne, though they were seldom aggressive. Three planes were lost during April and four were damaged, the total of lost and damaged planes being less than 3 percent of the sorties mounted. There were, however, 19 abortive sorties, some of them due to navigation error, and more than 20 planes failed to bomb the primary target. ⁶⁸

Because the Thirteenth Air Force was preoccupied with Biak during May 1944, Truk was free from strikes from the south except for seven harassing sorties. The Seventh Air Force managed to send out ⁷ seven missions and 101 sorties to the Carolines. Only ¹ one plane was lost, while ² two were damaged, but ² two others were abortive and 11 bombed secondary targets. Results,

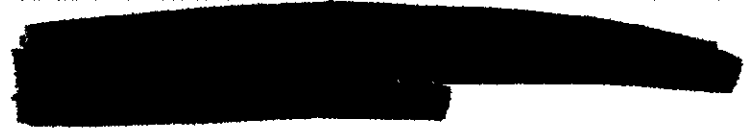
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insofar as crew reports are an indication, were probably not so good as during April, many bombs being unobserved or outside the target area. On the night of 2 May, however, the 11th Group claimed 88 percent hits and large secondary explosions. Antiaircraft and searchlights continued to be troublesome, though uncoordinated, and night fighters were more aggressive, attempting interception on several occasions. Probably the use of window kept the searchlights and antiaircraft artillery from being more effective. It might be added that the 11th Group, which lost no planes and had slight damage to only ¹one as a result of its 49 night sorties, suffered ²three planes lost and ⁷seven damaged out of 136 day sorties. None of the day missions were over targets defended as tenaciously as those in the Truk area. ⁶⁹

The campaign against Truk reached its climax in June and July. The Marianas were too distant from Seventh Air Force bases for B-24's to be used efficiently for preinvasion bombing, so the bombers were assigned the task of keeping the Carolines under bombardment throughout the Marianas campaign. The 868th Squadron of the Thirteenth Air Force put 40 sorties over Truk at night before 19 June, but thereafter the responsibility belonged to the Seventh Air Force alone. The month of June saw a switch from night to day bombing, the first five missions being flown at night, but only one more during the rest of the month. In all, 109 night sorties and 188 day sorties went against Truk. On the night missions no planes were lost, but two were damaged, one by a night fighter, and seven were abortive. During the day strikes no losses were suffered, but 15 B-24's were damaged and

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26 were abortive. Percentagewise, therefore, 2 percent of night sorties suffered damage as compared with 8 percent for day sorties. At night 6 percent of the planes scheduled failed to complete the mission, but this figure rose to 13 percent on daylight strikes.

The quality of night bombing in June, again judging from crew reports, was as good if not better than ~~had been the case~~ in April. Poor weather prevented observation in one instance, and observations were inconclusive another time, but one night mission was credited with 77 percent hits, a second with 85 percent hits, and a third with 93 percent hits. Without photographs, all comparisons of bombing results were perilous, but photographs of the day strikes were taken, and the bombing was so abysmally poor that night results could have been little worse had bombs been released on estimated time of arrival. More bombs hit in the water than on land, and many of those which did hit on land failed to strike the target area.⁷⁰

An attempted explanation is in order at this point. The greater ratio of damaged planes on day missions was almost certainly due to the fact that interception was encountered, and that day fighters were more aggressive than those encountered at night. The greater incidence of abortive missions was probably due to the fact that it was necessary to climb to higher altitudes for day bombing, thus putting a greater strain upon engines. Also, on high-altitude missions malfunctioning of the oxygen system could cause a turnback which would not have taken place at lower altitudes. Probably the poor accuracy of the daylight bombing can be attributed to a number



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of factors, of which interception, necessitating evasive action, was the most important. Also, crews whose skills had been used in night bombing for three months were probably not so proficient in day bombing as they were to become with practice. Lastly, as a matter of pure speculation, pilots accustomed to flying individual night bombing runs may not have been adept at holding the tight formation needed for a good bomb pattern.

The historian of the 30th Group noted crew reaction to the day missions. Some fliers felt "that the physical discomfort of flying at 18,000 to 22,000 feet, the restrictions imposed by the use of oxygen equipment and the necessity for more evasive action in the daytime reduced the bombing accuracy." Others, however, "especially the gunners, welcomed the daylight raids where they could 'see what they were doing,' and photographs were taken on day missions so the results could be more accurately determined."⁷¹

The bombing offensive against Truk continued through July and part of August, but nearly all the missions were flown by day. Eight out of 22 missions, or 63 out of 339 sorties, in July were at night. Still, if reports from aircrews are to be credited, the results of night missions were as good as those obtained in daylight. By mid-August, Truk was largely neutralized. This was probably due as much to the seizure of the Schouten ~~Group~~ and the Marianas as to air attack, but bombing had had a large part to play. The base was bombed at intervals until the end of the war, but it was never again a threat to Allied success.⁷²

Night bombing continued to be a function of the Liberators of the Seventh

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Air Force throughout 1944 and early 1945, though day missions were more numerous. Several radar-equipped SB-24's had been added to the organization's heavy bomber force during the Truk campaign, and after the 11th and 30th Groups moved up to the Marianas in late August 1944, the Snoopers were used extensively for night harassment of Japanese bases in the Bonin Islands.

Iwo Jima was the chief target of night raiders until the invasion of that island in February 1945. These single-plane attacks were designed not only to harass the troops occupying Iwo Jima, but also to prevent Japanese raids upon Allied bases in the Marianas. Radar was essential to these strikes, since the little island was usually cloud covered. Often bombs were aimed entirely by radar, but often, too, the shoreline could be used as an offset aiming point. Iwo was no "milk run" target; antiaircraft fire was so heavy that at least one squadron, the 38th, resorted to glide bombing to reduce the likelihood of being hit during the bomb run.

Another Seventh Air Force night activity during this period was mine-laying, a delicate operation which required precise navigation. In the Bonins the necessary pinpoint navigation was performed by radar-equipped pathfinders which dropped flares to indicate where the mines should be laid. The main Japanese harbors in the Bonins were mined effectively early in 1945, with the result that, although few ships were actually sunk, the amount of Japanese shipping observed was significantly reduced.⁷³

Night bombing in the CBI. The 7th Bombardment Group, which received

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B-24's in exchange for its antiquated B-17's early in 1943, did some night bombing from Indian bases throughout the war, but its offensive activity, day and night, was reduced by the necessity of ferrying gasoline to the Fourteenth Air Force in China. One night activity of late 1943 was mine-laying in the vicinity of Rangoon, where "intense ground fire was encountered as these missions were at extremely low level and over closely defended positions." Night effort was sporadic, however, and results were seldom worthy of note. Two exceptions might be noted: an assault upon the Victoria Lakes storage dumps at Rangoon, after the target had been marked by RAF pathfinders, effected considerable destruction, and a year later, in March 1945, a block of warehouses on the Bangkok waterfront, plus 45 smaller buildings, were destroyed by an incendiary attack.⁷⁴

The 12th Bombardment Group, which had become accustomed to night bombing in North Africa, Sicily, and Italy, had been assigned to the Tenth Air Force and had begun operations against the Japanese in the spring of 1944. Practically all the missions flown by these Mitchells over Burma were daylight strikes, but late in 1944 intruder missions were carried out, along with two unusually successful night bombing missions. On Christmas Eve, ~~night~~ 1944, five B-25's, led by the group commander, penetrated farther into Burma than medium bombers had ever before flown. Taking advantage of bright moonlight, the Mitchells proceeded to knock out Hninpale Bridge, east of Rangoon, with low-level attacks. Two nights later, five more B-25's used moonlight for attacks on "Pyinmana Airfields one and two."

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Results were excellent: "practically every bomb was laid right down the middle of the runway."⁷⁵

In China, night bombing had begun in the autumn of 1942 as related above. In December of that year B-25's of the 11th Squadron flew westward to attack Lashio and Tengchung at night. "These night raids were difficult, since targets in Burma were usually located in the valleys snugly surrounded by 10,000 feet [sic] (or higher) mountains." During the autumn of 1944, Fourteenth Air Force medium bombers carried out a number of presumably successful moonlight attacks on Japanese airdromes at Canton, but after October nearly all of their bombing was by day, though they flew intruder missions by night.⁷⁶

B-24's of the Fourteenth Air Force, on the other hand, engaged in a great deal of night bombing from autumn of 1943 until early 1945. This was one of the functions of the 308th Group, which flew its first night mission 16 October 1943. On this occasion it was planned that three bombers would lay mines in the Haiphong Ship Channel while seven others diverted the defenses by an attack upon Cat-Hoi Airdrome. Weather intervened, so only one plane laid mines, and only three bombed the airfield. Mine-laying at night was continued throughout the remainder of 1943, but the group flew from India part of the time. By 10 December all crews were back in China, and seven B-24's were sent after the hangars and repair shops at Hankow the following night. "Some of the crews, new at night flying, had difficulty staying with the formation," and only four were over the target. Nine planes

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went after the same target the next night, but the results were inconclusive. One Liberator ran out of gas after getting lost, but the crew bailed out and was rescued.⁷⁷

Occasional night attacks were continued during the first three months of 1944, and mines were laid on a number of missions. On one occasion, the group flew in such bright moonlight that the bombers went over the target in three-ship elements. An attempt to bomb on dark nights with the use of flares failed, however, because so many of the flares were defective that the bombardiers were handicapped. Night navigation proved to be the chief difficulty; quite a few bombs were dropped on "targets of opportunity,"⁷⁸ and two of the three B-24's lost at night failed to return because of navigation error.

During March 1944,⁷⁹ the 308th Group received several SB-24's, and these specially-equipped bombers were quickly put to work at mine-laying and pathfinding as well as searching for enemy shipping. Since shipping patrols did not always find shipping targets, unexpended bombs were dropped on land bases. Hong Kong, Formosan cities, and Hainan Island received many such attacks. Such bombing seldom did damage which could be specifically reported, but some destruction was accomplished, and the bombs certainly must have had some effect upon enemy morale.

Some regularly planned night bombing, in addition to harassment,⁸⁰ continued through 1944. A ten-plane raid on the Japanese storage area at Hankow⁸¹ 25 June was unusually successful, and it affords a good example of night bombing tactics:⁷⁹



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Bombing was carried out as planned and briefed. The four pathfinder planes arrived over the target and bombed very successfully between 2101 and 2106 hours, starting several fires in the target area. The remaining planes executed their bombing as individual flights during the succeeding 50 minutes. They made their bomb run from south to north from an altitude of 11,000 to 12,000 feet, dropping their bombs at 200 foot intervals. The target was well lit up by incendiary fires, and the partial moon was an additional aid. It is believed that 80% of the bombs were in the target area. Many new fires were started, and it is believed that much damage and demolition were accomplished. Several observers reported large secondary explosions, and fires could be seen for 80 miles away.

Until mid-July, takeoff for night missions in China had always been before sundown. For a strike against Paleuchi Airdrome, however, a night takeoff was executed so as to bring the bombers over the target at dawn. Two of the 18 planes ~~scheduled~~ crashed on takeoff, only 11 reached the target, and the bombing was poor. From July on, the number of night bombing missions declined, though Snoopers continued to bombard land targets with bombs which had not been needed against shipping. In addition, during November, ⁵ three heavy attacks were delivered against the Hankow waterfront at night. The bombing was excellent; it would have been above average in daylight. At least 65 percent of the bombs dropped were in the target area, and large fires and secondary explosions were noted in each case. This bombing was done in elements of two or three planes with the bombardiers using Norden bombsights. An old tactic was adapted to a specific situation:⁸⁰

November marked the first mission in which the direction of attack was at right angles to the longitudinal axis of the target in an attempt to determine if success could be achieved by flying

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a true course from an easily located initial point with the bombardier synchronizing on the line formed by water and land in the moonlight. This scheme using the line of demarcation between the Yangtze River and the City of Hankow proved disastrous for Jap installations on the Hankow waterfront.

As the war went on, the relative Allied air strength in China increased, so that night missions were no longer a necessity. Heavy bombers were driven out of their bases in South China by the Japanese ground offensive in that area, but by early 1945 Chinese coastal targets were within range of Allied planes based in the Philippines. The 373rd Squadron remained at Kunming and continued to fly sea patrols at night, but the 308th Group now bombed land targets by day. Such was the case in China until the end of the war. ⁸¹

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IV. INTRUSION IN WORLD WAR II

Introduction. As understood in this monograph, an intruder aircraft was one which flew over enemy territory ^{at night} ~~during the hours of darkness~~ in search of targets of opportunity. When such targets were not found, briefed targets might be attacked, but troop movements, motor transport, aircraft, and shipping were the primary targets.

Intruding began during World War II as a counter-air measure, but it grew until the chief emphasis was upon attacks on communications, especially motor transport, rail traffic, and shipping. Intrusion by night was found to be a necessary complement to bombing of bridges and marshalling yards, and to fighter sweeps of roads and railroads during the day. Allied air, enjoying practically undisputed superiority during the last two years of the war, was able to prevent all but an inconsiderable amount of day movement within fighter range of forward airfields. The bombing of bridges and marshalling yards impeded night movements, but could not halt them. An efficient intruder program was essential if true interdiction of the battlefield was to be attained. Such a program was not achieved in Europe before the end of the war, though a beginning had been made. In the Pacific few land communications existed, since the campaigns were from island to island, but night sea-searches did contribute, in cooperation with submarines and day bombers, to isolating those islands selected for conquest or neutralization.

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The RAF had begun flying intruder missions long before the United States became a belligerent in World War II. During the Battle of Britain Havoc (American P-70) night fighters flew into France while German planes were bombing British targets. There they lay in wait at German airfields, and often they succeeded in shooting down returning bombers as they were preparing to land. Sometimes these intruders managed to shoot down German planes on training flights.¹

The United States seems to have shown little interest in intrusion ^{with a few} ~~prior~~ to Pearl Harbor, or during the first year of actual warfare. One exception to this general indifference was Major G. Caldwell Russell, who was urging in the autumn of 1942 that an intruder training program be initiated; Russell realized that it would be difficult to find adequately trained pilots, but believed that a nucleus of men with RAF experience would be available. He had conducted experiments with the P-38, and believed that it might become a successful intruder plane. Early in 1944, 20 February to 25 April, four American pilots with two P-38's and two P-51's trained with an RAF intruder squadron. After this period of training, these pilots flew an aggregate of 21 missions over France. They sought enemy aircraft but found none. One of the P-38's was lost. From this experience it was decided that intrusion by single-seated planes was impractical.²

Thus during 1942 and 1943 practically nothing was done ^{to} ~~in the way of~~ developing intruder tactics, planes, and personnel in the Army Air Force.³ This is difficult to understand, especially when it is recalled that an

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eminently suitable plane for intrusion, the A-20 or its night fighter version, the P-70, was already in combat. The enemy was no doubt gratified that night intruder attacks did not develop. When Allied air superiority was established in Africa, Rommel expected "that in the future the enemy would be able to delay our operations at will by [?] strong air attacks by day and similar attacks at night with the aid of parachute flares."³

Intrusion in the Mediterranean. In Italy interdiction had had a large part in Allied planning and operations, but the Germans had nonetheless managed to keep themselves supplied. General Arnold noted that though every road and railroad leading to the German lines below Rome was cut, and though motor transport was being destroyed at the rate of 20^{to}30 vehicles a day, the German troops "held out and fought -- [?] fought well -- [?] for a remarkably long time."⁴ Allied leaders realized that the Germans were able to get enough supplies to keep going by confining ^{them to} ~~their~~ movements ^{to} ~~the hours of darkness.~~ Not only were they able to move supplies, but they were able to transfer divisions from one part of the line to another. Real interdiction was possible only if these night movements could be stopped, or at least reduced in large measure.

Night intrusion was seen as a possible answer to this problem in Italy and Southern France. In mid-1944 night fighters were ^{in the v. m.} flying uneventful patrols; ~~in the main~~ ^{it was} felt that the 414th Night Fighter Squadron could be spared for intruder work. Before the end of June, 414th Squadron Beaufighters were patrolling the Rhone Valley and shooting up trucks and

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locomotives. To add to the intruder effort, the 97th Bombardment Squadron of the 47th Group, equipped with A-20's, began training for night flying. This squadron sent out A-20's on intruder sorties over Italian communications the night of 29/30 June. In line with this increased awareness of the importance of intrusion was a 10 June meeting between the commander of the 63rd Fighter Wing and the commanders of the American night fighter squadrons in Italy; tactics and armament for night fighters which flew intrusion were discussed at this meeting. ⁵

During July the 47th Group continued its training program in night flying, and before the end of the month another squadron, the 86th, began operating as an intruder unit. Combat crews were reported to be "enthusiastic over night missions as they believe they are doing more damage than was formerly done on day missions." Out of the 44 missions and 654 sorties flown by the 47th Group in July, 21 missions and 166 sorties were flown at night. Little strafing was done; the usual tactic was to drop 100-lb. general purpose bombs upon lights, motor transport, or simply upon the roads if no movement was seen. One crew, finding nothing moving on the roads, attacked two merchant vessels in Spezia Harbor and claimed to have set them on fire with direct hits by ten out of 16 100-lb. bombs. ⁶

Little attempt was made to list specific damage and destruction caused by these light bomber sorties. Darkness and lack of photographs made exact analysis of results impossible. Whatever the actual destruction, it was believed that "Constant patrol would cause the enemy to operate his



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motor transport under partial or complete blackout conditions, thereby slowing down the road movement, and when lights . . . were attacked the convoys in all probability were forced to halt for a period of time." Three A-20's and their crews were lost on intruder missions during July.⁷

During August a third squadron of the 47th Group, the 85th, began flying intruder missions. Moreover, as the new type of operation became routine, more sorties were mounted per squadron. The 86th Squadron reported: "We are flying 10 to 12 sorties every night now . . . pretty busy keeping our ancient A-20's in flying condition." This unit's intruders caused "many fires and explosions amongst motor transport convoys, bridges, and lights along the roads in the western Po Valley." The night effort was further increased in August when the 417th Night Fighter Squadron added intrusion sorties to its defensive patrols.⁸

It was in August that the invasion of southern France took place. The 417th Night Fighter Squadron and units of the 47th Bombardment Group flew intruder missions in support of the landings. All the sorties of the 417th Squadron were directed at airfields, but the A-20's ranged the roads. Results from these missions were generally unimpressive, but spectacular observations were reported in a few cases.⁹

The invasion of Southern France met no heavy resistance; the enemy was unable to bring up reinforcements, for which the interdiction effort of the air received credit. The enemy forces were able to withdraw to the north, however, and this could not be prevented.¹⁰

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In order to accomplish total isolation of a battle area (within the limits of practicability) air attacks must be maintained against enemy communications during daylight and darkness. This latter requirement could not be entirely met with the limited night force available . . . and also due to the lack of precision blind bombing instruments. Only by saturation of the enemy communications area by night intruders and the use of precision pathfinders or blind bombing techniques on special night targets can assurance be given of complete isolation of the battle area.

The Mediterranean intruder program gained momentum in the Autumn of 1944. By September all four squadrons of the 47th Group were engaged in night operations, and the 416th Night Fighter Squadron began intruding the same month. Thus seven squadrons, four with A-20's and three with Beaufighters, were flying intruder missions from Mediterranean bases. Only the 47th Group was devoting its total effort to intrusion, however. The night fighter squadrons were flying intruder sorties when planes could be spared from regular defensive patrol.

The A-20's of the 47th Group continued to bomb lights and other signs of movement on the roads and railroads, and initiated bombing and strafing attacks on pontoon bridge sites. Tactical bombing of bridges had forced the Germans to rely on pontoon bridges which were hidden during the day but set up to receive traffic at night. Before the end of November, the group was ordered to make these crossings its primary objectives. Sixty sorties per night was the goal established, but mechanical failure and weather, especially fog, prevented this many planes' becoming airborne. On the night of 28/29 November, however, 49 A-20 sorties were flown.

When targets of opportunity were not discovered, the A-20's sometimes



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dropped their bombs by means of "Auntie" ^{there is a check mark} ~~This was~~ a very precise radar device, SCR-584, originally developed to aid in gun-laying. Since it could track a plane's course and determine its position with negligible error, the operator could stay on the ground and serve as bombardier for a plane bombing at night or through an overcast. Following the position of the plane with the radar scope, the operator could give course corrections which would bring the bomber to a predetermined bomb-release point, then order the bombs released. ~~This was a short range radar set, which limited such attacks to targets fairly near the front lines.~~ With "Auntie" ^{as with} attacks upon the roads and bridge sites, results were seldom known. Night after night the 47th Group bombed lights, strafed bridge sites, or dropped its bombs as ordered by the "Auntie" operator without being able to register precise claims of damage and destruction. ¹¹

The night fighter squadrons were not so conservative in their claims. Perhaps since the Beaufighters strafed their targets instead of bombing them, the pilots were justified in making more specific claims. From strafing altitude it should have been possible to observe results more accurately. During November and December the 414th and 416th Squadrons flew fewer than 250 intruder sorties, but made strong claims, amounting to 56 locomotives, 159 railroad cars, and 531 motor vehicles destroyed or damaged. ¹²

The 47th Group still hesitated to make specific claims, but the following account of one night's operations demonstrated that the A-20's too were

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finding a great many targets:¹³

On the night of 1/2 December 1944 we had 13 aircraft over the Po Valley and the Brenner Pass on intruder and reconnaissance patrol. On this night our attacks proved unusually successful as reported by our combat crews. Three trains were attacked, two from an altitude of 100 feet, and two of the three locomotives were destroyed and the other damaged. Approximately 100 cars comprising these trains were attacked with 260 lb. frags, parafrags and machine gun fire, starting many fires and two explosions. Other sorties this night claimed a power or pumping station damaged (if not destroyed) and 4 large explosions and one large fire in other target areas. The reconnaissance reports turned in by our crews also are helpful in determining the movement and supply routes being used in support of the German assault troops in the front lines.

Similar missions continued throughout the rest of the war. That part of northern Italy still occupied by the Germans was covered, when weather permitted, by A-20's, Beaufighters, Mosquitoes, and, before V_EJ Day, Black Widows. Weather, and fog in particular, was an obstacle. So, surprisingly enough, was bright moonlight, which made "it possible for the enemy to travel by land without showing any lights. Thus it was exceedingly difficult for aircrews to find the enemy." Even on moonlight nights, however, targets seem to have been abundant.¹⁴

During 1945 the night fighters devoted more and more of their attention to enemy airfields in north Italy. In addition to their machine guns and cannon, they now began to carry 500-lb. and 1,000-lb. demolition bombs. The 414th Squadron set some sort of record when it claimed to have delivered 4,000 pounds of bombs on one sortie. These patrols over German airfields were so successful that for some time the Luftwaffe was unable to send reconnaissance planes over Allied lines. However, the introduction of



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jets permitted daylight reconnaissance before the end of the war.¹⁵

Intruder claims continued to mount as the war in Italy went on. The 47th Group reported 37 M/T as observed destroyed, and claimed to have caused 14 fires, ¹one roadblock, and no less than 108 explosions other than bomb bursts as a result of 125 sorties flown on the first six nights in February. The group's A-20's were gradually being replaced by A-26's (later known as B-26's), and this apparently added to the efficiency of the unit. Between sundown of 21 April and dawn of 24 April the 47th Group as a whole flew an astonishing 334 sorties. During these three nights 55 trucks, 17 railroad cars, ¹one fuel dump, ³three horse-drawn vehicles, ²two buildings, ⁴four pontoons, and ²two motorcycles were claimed as definitely destroyed. The claims of equipment damaged ran much higher, and included two tanks. Since all results were not observed, it was possible that the actual destruction and damage was considerably greater than the amount claimed. All this was accomplished for the loss of two A-20's and one A-26.¹⁶

The intrusion program carried out in Italy was the most extensive attempted by American units during World War II. Two conclusions are evident. First, as crews gained experience in intrusion, they became more adept at locating and destroying targets. The accomplishments of intruder aircraft in Italy became more impressive each month from mid-1944 until the closing weeks of the war. This points to the second conclusion: that not enough intruder sorties were carried out. To have flown more sorties, of course, would have necessitated the assignment of more planes and crews. Apparently intruder sorties never reached the point that a few more

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sorties would not have resulted in increased destruction to enemy supplies. Until intruders made the roads as unsafe by night as fighters made them by day, enemy supplies and reinforcements would continue to reach the front lines.

Intrusion in France and Germany. In France, too, intruders had a part to play. The German General Rundstedt reported: "The closer an area is to the combat zone, the more frequently appear fighters and fighter bombers employed in 'road hunting.' By attacking in good weather during daytime and with the help of flares at night, they impede any large scale movements."¹⁷ It would appear, insofar as night attacks were concerned, that General Rundstedt was unduly pessimistic. Intrusion over France was not carried on to the same extent as in Italy.

American intruder missions over France and Germany were a function of three night fighter squadrons, the 422nd, 425th, and 415th, and the 474th Fighter-Bomber Group, the last equipped with P-38's. Detachments of night fighter squadrons from the Mediterranean were also sent to France before the end of the war. The 415th Squadron, which came in with the invasion force in southern France, flew Beaufighters almost until the end of the war, but the other units were equipped with P-61's when they entered combat. In addition to its Black Widows, the 422nd Squadron operated seven A-20's early in 1945, using them for night bombing as a complement to strafing by the P-61's.

So soon as it was realized that the enemy was making almost all his

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troop movements in France at night, as a defense against fighter-bomber attacks during the day, some way was sought to disorganize his movements at night. The P-38's of the 474th Group were used first. The fighters were directed to and from their target areas by SCR-584 radar, and this system worked fairly well insofar as getting the fighters there and back was concerned. The P-38's were definitely not a success as intruders, however. Even in September 1944 weather was a serious hazard to intruders in France, and the malfunctioning of flares and bombs decreased efficiency. One sortie on 9 September did succeed in destroying nine vehicles, but results were more often nil or unobserved. Also, the cost was high; two P-38's were shot down for less than 50 sorties flown, one of them by "friendly" flak. The single-seat P-38 was not suited to intrusion, and the pilots definitely did not enjoy flying such missions.¹⁸

It proved possible to use P-61's for intrusion because Luftwaffe reaction to the liberation of France was much lighter than had been expected. "Except during the Luftwaffe's brief resurgence in connection with the ARDENNES counteroffensive, German night operations in the XIX area did not justify much effort in defensive patrols. Offensive intruder missions proved a far more profitable employment of our night fighter squadron."¹⁹

Both the 422nd and 425th Squadrons were engaged in intruder work by October 1944, though not to the exclusion of defensive patrols. The results of the first 20 intruder sorties sent out by the 425th Squadron were not impressive. Sixteen planes made no claims at all. The other four attacked

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and claimed as damaged or destroyed three vehicles, two factories, five locomotives, one railroad station, and one signal tower. During the same month the 422nd Squadron destroyed ~~two~~² locomotives and 26 railroad cars, and damaged ~~eight~~⁸ locomotives and 140 cars. These results, it should be added, were largely incidental; most intruder activity was devoted to heckling German airfields to prevent fighter-bomber attacks on Allied positions at dusk. ~~In meantime~~^{Meanwhile} the 415th Squadron, in addition to normal intruder duties, was patrolling the lines at St. Die and dropping flares ~~7~~⁷ many of which failed to ignite ~~--~~⁺ to illuminate targets for artillery.²⁰

The pace of intrusion was quickened somewhat in November. The 422nd Squadron destroyed ~~three~~³ locomotives and damaged ~~four~~⁴ more, and also damaged 95 railroad cars, a factory, a warehouse, and ~~three~~³ switching towers. ~~General~~^{General} Patton noted that 18 November "was a great day for the air. The XIX Tactical Air Command started flying at dawn and flew until well after dark; then they sent out their night fighters, which attacked some fifteen convoys in the darkness."²¹

The Luftwaffe became active during the Battle of the Bulge, and night fighters ~~became occupied~~^{were} mainly with defensive patrols. Even during the month of December, however, the 425th Squadron destroyed 58 trucks, ~~three~~³ locomotives, and 16 railroad cars. The 422nd Squadron also destroyed ~~three~~³ locomotives, and claimed to have damaged 57 vehicles. During December this latter squadron was assigned seven ancient A-20's, which had dropped almost seven tons of 500-~~lb.~~^{lb.} bombs before the year ended.²²



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Intrusion in France followed very much the same course as it had in Italy, though on a much smaller scale, ~~insofar as American units were concerned.~~ The bag of enemy vehicles and rail stock increased as crews gained experience. However, weather interfered with operations in France and Germany even more than had ~~been the case~~ in Italy. Night fighter squadrons were unable to take full advantage of the opportunities afforded by the German advance and retreat in the Ardennes because of weather. Also, the night fighter units were short of P-61's and replacements, a situation which was not improved any when the 425th Squadron lost two planes to "friendly" antiaircraft. The 422nd Squadron was able to fly only ~~nine~~ nights in January for a total of 26 sorties, only 17 nights in February, and only 23 nights in March. Another handicap, in the spring of 1945, was the fact that the front moved so rapidly that it was soon out of night fighter range. A detachment of the 414th Squadron, which was attached to the Ninth Air Force for a short time, did considerable intruder work at first, but the bad weather and the distance from its Belgian bases to the front soon reduced its effort.²³

During 1945 the P-61's began to carry 165-gallon tanks filled with napalm, and, sometimes, ^{high explosive} high explosive bombs. A few planes were fitted with rocket tubes. "A popular and effective employment was to bomb any suitable target with two 165 gallon tanks of napalm, then turn and use the resulting blaze as an aiming point for rocket fire." The A-20's attached to the 422nd Night Fighter Squadron bombed under control of SCR-584 radar operators, but seldom knew the results of their efforts. When P-61's began low-level

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bombing during the bright moon period of March, the crews professed relief at being able to see the destruction they accomplished. This bombing was, of course, in addition to continued attacks upon locomotives and motor transport.²⁴

At the end of the war, the 422nd Squadron gave some thought to its role as an intruder force. On the basis of the unit's experience, the squadron intelligence officer believed that its planes could successfully cover road nets, and that attacks upon such prearranged targets as dumps, motor pools, troop concentrations, and communications centers were feasible. Prearranged pinpoint targets, however, could be successfully struck at night only when conditions were ideal. While there is no indication that such tactics were ever attempted, the squadron believed that it could deliver low-level strafing attacks in direct support of the ground forces by using flares, or by strafing areas marked in some way by the ground forces. Flares alone were believed to have a good harassing effect.

The 422nd Squadron did not consider the Black Widow an ideal plane for intrusion, but felt that the AI equipment should be removed if the plane was to be used. The ideal intruder plane, in addition to speed and fire power, needed an absolute altimeter, rear-view radar, and bomb racks, both wing and fuselage type, able to handle gas tanks, bombs, or flares. It was further concluded that the intruder crew should include a navigator who could handle the difficult task of target location. Another need was for a better flare. Of the M-26 flares released by this unit, some 80 percent were duds. The

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squadron believed that it had little more than "scratched the surface" of intruder possibilities.²⁵

Intrusion in the CBI. Some of the best intruder results of the war were achieved in the China-Burma-India ~~Theater, of Operations.~~ This did not come about because of high-level planning of an intruder program. Effective intruder sorties resulted, first, from the fact that Japanese communications in Burma were confined to a single net of north-south roads, one railroad, and the Irrawaddy River, all of which were vulnerable to air attack, and, second, from the fact that the Japanese army exposed itself to intruder attack during its 1944 offensive in China.

Burmese communications were so exposed to air attack that by the beginning of the good weather period of 1944, supplies to front-line positions were reduced to a critical point by daylight air strikes. Rail and river traffic north of Mandalay were reduced almost to a standstill, and attacks on bridges greatly hampered motor transport. Moreover, when a truck or train tried to move by day, it was usually discovered and strafed by fighter planes. As was the case elsewhere, the enemy began moving his men and supplies at night when he found himself faced with overwhelming air superiority. Because of this, a modest intruder program began in late 1944.

Three units, the 427th Night Fighter Squadron, the 490th Bombardment Squadron, and the 12th Bombardment Group participated in these intruder attacks. The 427th Squadron enjoyed some success in this type of mission in early 1945, but it never operated on a large scale. The 12th Bombardment

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Group had for some time operated over Burma as a medium bombardment unit, dropping its bombs from medium altitude. This unit had flown night bombing missions in the Mediterranean before coming to India, but the crews who had gained experience in night flying had been rotated by December of 1944. Hence the 12th Group had neither the low-altitude experience nor the night flying experience needed for intruder success when it began flying such missions. In its "more than forty" such sorties, the group functioned more as an harassing agent than as a true intruder force. On a few occasions the crews of these B-25's did sight and strafe trains and motor transportation, but the usual mission resulted in bombs dropped in the neighborhood of towns or airfields.²⁶

During late 1944 and early 1945 the 490th Bombardment Squadron kept a detachment of B-25's at Myitkyina to serve as a close-support force in daylight and to fly intruder sorties at night. Without radar or other specific night flying aids, these B-25's could operate only in moonlight, but they nonetheless obtained excellent results. On the first six nights of December 1944 the Mitchells flew 11 sorties. On these missions the planes bombed and strafed ⁵five locomotives, 137 railroad cars, 11 truck convoys, ²two buildings, ¹one marshalling yard, ¹one bridge construction job, ¹one airfield, and ¹one antiaircraft position. One of the trains attacked on the night of 2 December was ^{attacked}~~brought to a halt~~ by a direct hit with fragmentation bombs, ^{resulting in} then strafed. In addition to these attacks, the Mitchells strafed camp fires and other lights visible from the air whenever ammunition was still available.²⁷

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Probably Japanese communications in northern Burma were as heavily attacked from the air, mile for mile, as were communications in any other zone of action. Yet the experience of the 490th Squadron demonstrated that intruder crews who would search, bomb, and strafe from low altitude could find and destroy targets. Despite the weight of attack on bridges, trackage, marshalling yards, and supply dumps, supplies still reached (troops in the front-lines) at night. When one intruder plane was able to find and attack six truck convoys on one moonlight night, intrusion certainly had not been carried to the point of diminishing returns. In Burma, as in France, the ^{AAF} ~~Air Force~~ had no more than scratched the surface of intruder possibilities.

The Japanese launched an offensive in China in mid-1944, aiming it at American air bases. Fighter planes and medium bombers reaped a rich harvest from daylight road movements during the early phase of this offensive, and when movement of troops and supplies by day proved too costly, the enemy sought the cover of darkness for protection from the air. As day targets dwindled in number, the 11th Bombardment Squadron, which had night bombing experience and experience in low-level strafing by day, initiated a program of intrusion designed to destroy men and material on the roads at night.

The tactics were relatively simple. When the moon furnished enough light for operating ~~B-25's~~ at night, ^{B-25's} crews took off from ^{it} their bases and navigated to some predetermined town or road junction. From that point, the B-25 began following a road the Japanese were thought to be using,





flying at 1,500-foot altitude. When truck lights were spotted, the intruder dropped down ~~to low level~~, sometimes as low as 150 feet, and swept down the length of the convoy, strafing with forward-firing machine guns and dropping parafrags. Such attacks were delivered so swiftly that some headlights were still burning, in many cases, when the attack was completed. Crews discovered that if they returned to the same area about 20 minutes later the surviving units of the convoy would be underway again with lights on, and thus vulnerable to another assault. Only the Mitchells' machine guns were used for strafing, because the flash of the 75-mm. cannon blinded the pilot. A variation of this tactic was a low-level river sweep in the moonlight. Even when a night bombing attack was delivered on a briefed target, planes came down and strafed road traffic on the way home.

If the claims of the 11th Squadron were justified, these intruder attacks were highly successful -- probably more successful in proportion to the effort involved than similar missions anywhere else during World War II. The river sweeps were "a profitable type of mission which . . . we exploited with extraordinary success." In August and September "low altitude road-sweeps by night . . . accounted for more than a thousand trucks and untold numbers of enemy personnel." No doubt these claims, like so many others, were a bit on the optimistic side. Nonetheless, when a B-25 strafed a truck convoy from 200 feet, a great deal of damage and destruction was sure to result.

A number of factors explain the productivity of these attacks. One



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was the crews' familiarity with the terrain. Fourteenth Air Force crews flew over the same territory throughout the war, and therefore came to know it well. Attacks were made only when motor convoys were in the valleys, ~~so~~ there was less danger of flying into hills or mountains than there would have been had the terrain been unfamiliar. The crews of the 11th Squadron had had experience in low-level strafing of motor traffic in daylight, and they had had night flying experience. The combining of the two skills made it possible for successful attacks to be made on motor convoys in moonlight. Probably the most important factor of all, however, was the fact that the enemy was moving forward in a great offensive and therefore afforded an unusual number of targets. For all these reasons, the 11th Squadron enjoyed excellent hunting during the late summer and early autumn of 1944.²⁸

It cannot be said that the intruder effort in China forced the Japanese to abandon their offensive, though it may have reduced its momentum. Again, intrusion was not carried far enough to deny to the enemy the use of the roads at night. In March 1945, when the 426th Night Fighter Squadron began to fly intruder sorties, abundant targets were still available. These P-61's flew only ~~six~~ intruder sorties in March, and claimed to have destroyed or damaged ~~five~~ locomotives, 22 railroad cars, ~~one~~ switching tower, and 54 trucks. According to the unit history, by the end of April 60 trucks had been destroyed and 150 damaged, "seven locomotives destroyed and twenty damaged and an unestimated number of enemy troops killed and wounded."

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It is interesting to note that one of these intruders found troops drawn up in a pre-dawn formation 25 April 1945 and claimed to have killed 25 of them. All these claims for March and April resulted from 17 sorties.

A comparison of the claims made by the 426th Squadron with intruder results in other theaters of war leaves the impression that the 426th overstated its case. While it was entirely possible for P-61's to destroy or damage ~~three~~³ tanks, 12 locomotives, and 85 vehicles in 16 sorties, as was claimed in June, it was not probable. When claims were so high, however, it would seem evident that many targets had been sighted, at least.²⁹ It might appear, then, that in this case intrusion was carried on until it did reach the point of diminishing returns. Such was not necessarily true. By July 1945 Japan was on the verge of complete exhaustion. Surrender was to come early the ~~next~~^{next} month. Therefore, the course of the Pacific war as a whole, rather than the activities of the intruders in particular, probably had more effect in reducing the number of targets within range of the China-based P-61's and B-25's.

Intrusion in the Pacific. In the amphibious Pacific war against Japan, intrusion upon land targets was hardly a profitable activity except, perhaps, as a counter-air force tactic. There were no land communications between Japanese positions whether these were actually on small islands or, like the strongholds along the coast of New Guinea, dependent upon water transportation for reinforcement and supplies despite their location on a large land mass. Hence, with a few exceptions, attacks on shipping were the



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effective means of interdiction in the Pacific. Some intruder missions were flown against land targets, however.

As in Europe, intrusion in the Pacific ^{area} was largely a function of night fighter units. In fact, it would appear that such missions were initiated simply in order to make some use of the P-70's which proved so disappointing as night interceptors. This opinion was borne out by the fact that when P-61's became available, night fighter intrusion ceased until the spring of 1945.

Detachment "B" of the 6th Night Fighter Squadron, which furnished night fighter defense of Guadalcanal from March until November 1943, began flying intruder sorties over Bougainville in October 1943. These sorties were directed at Japanese airfields, and they seem to have enjoyed some success. The 307th Bombardment Group gave the P-70's credit for the fact that they received no searchlights because "a P-70 shot out 4 out of 5 searchlights at Kahili on 15 November." ³⁰

The 419th Night Fighter Squadron, which replaced Detachment "B" on Guadalcanal, flew six intruder missions over Bougainville between 16 November and 31 December 1943, and lost two P-70's in the process. In January and February 1944 such sorties were continued without such prohibitive losses, but they do not seem to have been particularly effective. This unit also used P-38's as intruders during this period, though to a very limited extent. Such sorties continued until June when the 419th Squadron began flying P-61's as true night fighters. ³¹

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During the bright moon period of April 1944 the night fighter organizations of the Southwest Pacific, the 418th and 421st Squadrons, began a regular program of intruder missions. Apparently such missions had been flown earlier, though not as a regular practice. The results of these sorties, if any, were not observed. It is interesting to note that the radar observer sometimes carried six 20-~~lb~~^{lb} fragmentation bombs in the cockpit, fused them by hand, then passed them to the gunner to be dropped on tempting targets. In general, the April missions "were uneventful, resulting in the strafing of enemy installations, anti-aircraft positions and barge landings."³²

Few night sorties were flown in May, since the 421st Squadron had exchanged its P-70's for P-38's, unsuitable for night missions. The 418th Squadron also turned in its P-70's, but this unit received strafing model B-25H's in exchange. During May these heavily armed medium bombers were used for daylight strafing, but when the squadron moved up to Hollandia in June 1944, night intruder operations were resumed. On the night of 8 June a B-25 swept into Babo Airfield at 150 feet, dropped eight 100-~~lb~~^{lb} para+demo ^{bombs}, and expended 2,300 rounds of .50-caliber ammunition. During the remainder of the month Wewak, Dagua, and But Airdromes were frequently attacked. In addition, several sorties were flown in cooperation with PT boats. "By using us as bait for the ack-ack, the PT's would cruise along shore and upon spotting the gun emplacements firing at us would proceed to knock them out. This was carried on with a great deal of success."³³

Some intrusion continued for the 418th Squadron in July and August 1944,

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but the main effort in July was devoted to sea sweeps, and during August to transition to P-61's. Apparently a few intruder missions were flown in P-61's in August, but if so, they were without incident. By September 1944 all three of the Fifth and Thirteenth Air Force night fighter squadrons were equipped with Black Widows. With these airplanes it was possible, as it had not been before their arrival, to operate successfully as AI night fighter units. Since such a function was still very much in demand, intrusion went by the board until the spring of 1945, by which time the danger of Japanese night air attacks had greatly lessened.³⁴

With the Luzon campaign, intrusion again began to play a part in the Pacific war. Heavy bombers acted as intruders and did very well at it during the first days of the Luzon invasion, if the history of the 63rd Bombardment Squadron is to be credited. This unit was given the specific task of bombing, strafing, and harassing "truck convoys and motor traffic scuttling north from Manila toward the onrushing American." The 63rd Squadron and the 90th Group had two to four planes over the roads from Manila northward each of the first three nights after the landings. Operating from low, though not treetop, altitude, the B-24's and SB-24's dropped 100-lb. demolition and 260-lb. fragmentation bombs on truck convoys, and sometimes descended to strafing altitude in order to use their machine guns. Considerable destruction and disruption of Japanese transport was claimed by returning crews. No more heavy bombers were sent out as intruders after a 90th Group B-24 failed to return from Luzon on the third night.³⁵

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It was also in the Luzon campaign that night fighters again began to perform as intruders. Out of 270 sorties flown in January 1945, the 547th Night Fighter Squadron flew [?]eight which could be called intruder sorties. On two missions which operations records called "close support," 14 trucks were destroyed. In February this unit's intruder activities increased. Rather than going "out on missions over enemy territory in northern Luzon, spotting enemy vehicular traffic all along the roads, bivouac areas, etc." and being forbidden "to do anything about it," pilots began to attack these tempting targets. "Results? Yes there were results. During the month many Japanese trucks and other vehicles were destroyed by P-61 strafing; damage to enemy airstrips was accomplished by the dropping of 500 lb. GP bombs. . . ."36

One type of mission flown during 1945, and which may be classified as intrusion, was artillery spotting. As a matter of fact, the spotting ability of the relatively fast P-61's was not great. The chief purpose served by night fighters over the front lines ~~at night~~ was to inhibit enemy artillery fire. Ground commanders reported that the Japanese artillery was afraid to fire when night fighters were overhead. The 38th Bombardment Group, which had gained night flying experience in its B-25's at Morotai, participated in this type mission. The 38th Group crews did not regard such work as worth while: "Not much can be said for such missions except that the boys get some practice in night flying." They took comfort, however, from the fact that "the Nips just don't like to fire their guns when a B-25 is keeping a watchful eye from above."37

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The small number of intrusion missions accomplished in the Pacific during the remaining months of the war were directed at Japanese airfields to a greater extent than at communications. The 418th, 547th, and 421st Night Fighter Squadrons sought prey on airfields in Northern Luzon. The 419th and 550th Squadrons intruded over airdromes in Borneo, while the 548th and 549th Squadrons ranged over landing grounds in the Japanese-held Bonin Islands. No doubt these sorties deterred the Japanese in attempts to use their airfields, but the harassing effect cannot be evaluated, and concrete results were seldom attained.³⁸

In April 1945 Philippine-based P-61's began flying intruder missions over Formosa, still emphasizing attacks on airfields. In June the 547th Squadron flew 18 such sorties and succeeded in shooting down an enemy transport at Kapataua Airfield. Also, though the mission should probably be considered night bombing rather than intrusion, a Black Widow scored direct hits on the Ensuiiko Sugar Refinery with napalm bombs.

In July 1945 the 421st and 418th Squadrons moved forward to Ie Shima and Okinawa respectively. There they were joined by the 548th Squadron from Iwo Jima. From these islands the Japanese airfields on Kyushu were brought under attack during the remaining weeks of the war. One 418th Squadron P-61 shot down a Betty bomber on one of these intruder sorties. Ordinarily, during these weeks, the weather over Japan was too bad for low-level missions. Usually the Black Widows carried 500-lb. or 1,000-lb. bombs which they dropped through the prevalent overcast by radar, or sometimes

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on ETA (estimated time of arrival).³⁹

As may be noted from this account, intrusion was not a prominent ~~Air Force~~ activity in the Pacific area. There was some tendency, perhaps, toward a systematized program of intrusion during the last months of the war, but the conflict ended before this program could get under way. Why the ~~Air Force~~ ^{AAF} in the Pacific lagged behind even the slight efforts of other theaters of war in the employment of intrusion could no doubt be explained.

In the first place, as previously noted, the small islands of the Pacific offered little or no opportunity for intruder attacks on land communications. Secondly, the night fighter squadrons, which had the planes and trained personnel best suited for intrusion, were badly needed from mid-1944, when P-61's became available, until early 1945 for their first priority mission, defense against night bombing attacks. When the threat of Japanese raids was largely ended, intrusion did begin, but the war was over before it could have any significant effect. It was by attacks on shipping that the ~~Air Force~~ hoped to isolate the Pacific battlefields.

Snoopers and Japanese shipping. Japanese shipping was certainly not allowed to proceed unmolested in the Pacific, whether by night or by day. It was known from the beginning that Japanese operations were dependent upon water transportation, and attacks on shipping began with the outbreak of hostilities. By late 1942 the 63rd Squadron of the 43rd Bombardment Group had developed the technique of skip bombing and had begun to use this technique at night. On the night of 23 October 1942 the B-17's of this squadron struck shipping in Rabaul Harbor from 250-foot altitude, and several

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more such attacks were made in November.

The technique used for night skip-bombing attacks was primitive but apparently effective. The sight used is eloquent testimony to the novelty of such bombing. It consisted of an "X" marked on the co-pilot's window, which was lined up with the most forward visible part of the nose of the aircraft to determine the bomb-release point. "Under these conditions in level flight at 250 feet, indicating . . . 220 miles an hour, a bomb will fall from sixty feet to one hundred feet short of the vessel, skip into the air and . . . hit the side of the vessel and sink." The explosion of the delayed-action bomb was, of course, expected to breach the side of the ship below the waterline.

A dark night with a moon less than 20° above the horizon was preferred for this type of attack. The airplane searched on a north-south course at 500-foot altitude so that on either a north or a south heading the moon path was always stretching to the right and left of the aircraft, making a ship, or at least its wake, visible. When a potential victim was sighted, the B-17 glided down to 250 feet with throttles cut back, holding its speed to 220 miles an hour. In both types of attack the airplane pulled over the target ship after its bombs were released, when gained speed in a slight dive while turning gently toward the bow of the ship.⁴⁰

The events of 1942 and the first half of 1943 proved that when shipping could be located, it could be attacked at night from low altitude, and the Battle of the Bismarck Sea, in March 1943, proved to the Japanese that

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they could not successfully move shipping within range of Allied bombers in daylight. ~~As a result, enemy vessels began moving from port to port under cover of darkness.~~ Moreover, when supplies reached the combat zone, they were removed from ships and transferred to barges which moved along the coasts at night and lay concealed during the day. Many barges were, of course, destroyed, but others got through. The Allies badly needed some means not only to find the barges at night, but to attack the shipping which brought the supplies to the rear depots.

The SB-24, or Snoop^{er}, supplied this need. This aircraft was a B-24 heavy bomber which had been fitted with complicated radar equipment. Even on the darkest nights, surface shipping could be located by means of the SCR-717 ASV (air-to-surface vessel) radar. When located, the ship could be identified as friendly or hostile by means of SCR-729 airborne IFF. If the vessel proved hostile, it could be bombed, even in complete darkness, by AN/APQ-5 low-altitude radar bombing equipment, better known simply as LAB. The SB-24 was also provided with ARN-1 absolute altimeter which not only contributed to safety on long over^{er}water flights, but also added to bombing accuracy.⁴¹

Three organizations were equipped with SB-24's. These were the 63rd Bombardment Squadron of the Fifth Air Force, the 394th Bombardment Squadron of the Thirteenth Air Force, and the 308th Bombardment Group of the Fourteenth Air Force. The SB-24 section of the 394th Squadron was eventually activated as a new and independent squadron, the 868th. The units

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which received these aircraft were quick to take advantage of them. The 394th Squadron, for example, had the Snoopers in action five days after they were received in August 1943. Henceforth these planes were out over the shipping lanes almost nightly, bombing from 1,200 to 1,500 feet, often with surprising accuracy. . . . Perhaps their most distinguished performance came on the night of 28 September when five of the eight SB-24's aloft . . . attacked a 10- or 11-ship convoy just north of Cape Alexander, sinking one destroyer and damaging other ships sufficiently to cause the convoy to reverse its course. It should be added that like most Snoopers claims, this one was overly optimistic. No Japanese destroyer was sunk on this date.⁴²

The tactics of the Snoopers were simple. On even the darkest night the search radar revealed any shipping moving any distance away from the shoreline. When a vessel was located and determined hostile, the bomber immediately commenced a bomb run. The LAB computer, which enabled the Norden bombsight and the radar set to be used in conjunction, brought the Snoopers over its quarry. When visibility was good, the run could sometimes be completed visually, but even on the blackest night the bombs could be aimed with the LAB computer. If claims could be accepted at face value, the results of LAB bombing were as good as those obtained by visual bombing.

The bombs used were 500- or 1000-pounders, three or four of which were dropped in train. Fuzing was ordinarily for a one- or two-second delay for attacks on surface ships, but the planes carried other types of fuzes which

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could be put on the bombs in case they were needed. If no shipping was found and a land target was attacked, instantaneous or short-delay fuses were used. If it became feasible or necessary to make a skip-bombing attack, a fuse with four or five-second delay was inserted in the bombs.

There were a number of ways of estimating the results of attacks carried out in darkness. The bombardier could determine whether the run had been a good one simply by holding the bomb-release heading until the time of impact, though this was hardly advisable if antiaircraft fire was being received. Near the end of the war, photographs of the radar screen were made at the time of bomb release, and when compared with heading, air-speed, etc. could be used in evaluating claims. If a direct hit was made, it was evident from the concussion felt aboard the bomber -- ^{it} very different from the dull thud of a bomb exploding under the water. Of course, if fires were started, the ship became visible.

Only on the darkest night, however, was the target completely invisible at the time of impact. At that instant, if the same heading had been kept, the bomber was almost directly overhead. Hence, near-misses could often be observed, and near-misses, because of the hydraulic effect of an underwater explosion, were sometimes more damaging than a direct hit. Supposedly a ship was claimed as sunk only if it was ^{visually} visually observed to go down, if it disappeared from the radar screen when the set was functioning well, or if it was so enveloped in flame that it was certainly destroyed. A near-miss, a direct hit, or a fire was basis enough for a claim of damage.

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When the evidence indicated sinking but was not considered conclusive, a claim of probably sunk could be made. A claim of a ship sunk based on observation of the radar screen alone was stronger if other ships were in the vicinity and remained visible when the ship which had been bombed disappeared. A claim of damage based upon concussion alone was under suspicion because a reef often gave the same radar return as a ship. Since bombs were observed to hit reefs in some cases, no doubt some "damaged" sand spits were claimed as enemy shipping. Yet a study based only upon the records of the ^{A, F} ~~Air Force~~ organizations making the claims might well reach the conclusion that the claims of enemy ships sunk, probably sunk, and damaged were in large measure valid.⁴³

Such a conclusion would be erroneous. Through the war the three LAB-equipped heavy bomber units claimed to have sunk some 344 ships, with 62 probably sunk and 446 damaged.⁴⁴ But, according to the Joint Army-Navy Assessment Committee's ^(JANAC) compilation of Japanese naval and merchant vessels sunk, only 310 ships, 70 naval and 240 merchant-type, were sunk by all kinds of army aircraft throughout the war. It is impossible to go further and state how many ships were sunk by day bombers, but recalling the Battle of the Bismarck Sea, the many attacks on Rabaul Harbor, and the heavy losses in shipping suffered by the Japanese in their attempts to reinforce Leyte, it is evident that day bombers had a considerable part in the destruction of Japanese shipping.⁴⁵

In defense of the LAB units' claims, it may be noted that many barges,



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which were not accounted for in the ~~Assessment Committee~~ report, are among the ships claimed as sunk. For example, 24 of the 140 vessels claimed by the 868th Squadron were barges. Such a defense can be carried only so far, however, because a further check of the aforementioned report will demonstrate again that claims were greatly exaggerated. During September 1944 the 308th Group claimed to have sunk no less than 32 enemy ships on its patrols of the Formosa Straits^y and the South China Sea. Thirty-one of the ships claimed were merchant type. But according to the report cited, only three ships were sunk by army aircraft during September, and one of these went down in an area beyond the range of the 308th Group. One other ship was lost to an unknown agent off the China coast during the month, and thus may be charitably ascribed to LAB action. During March of 1945 all three LAB units claimed 27 ships sunk when, in reality, only 20 were sent to the bottom by all army aircraft during the month. These were flagrant examples, but others might have been cited.⁴⁶

The question therefore arises as to whether claims of ships damaged were as unrealistic as claims of shipping sunk. Probably, like claims of sinking, claims of ships damaged by LAB units were somewhat excessive. It seems quite probable that some reports of ships damaged resulted from bomb hits of reefs. But ships claimed as sunk when they really were not, and ships claimed as probably sunk, were probably damaged. Adding these to those claimed as damaged gives a respectable total even if heavy discounting is necessary.

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Such a conclusion is supported by a report of the Naval Analysis Division of the United States Strategic Bombing Survey. In its investigation into the fate of Japanese naval craft, the survey found that many destroyers and heavier vessels survived more or less serious damage by air attacks on several occasions, only to go to the bottom finally as the victim of a mine or torpedo.⁴⁷ Aerial bombs, unless they exploded underwater almost against a ship's hull were not so likely to cause fatal injury as were mines and torpedoes. Skip bombing was especially deadly because the probability of this type of explosion was greatly increased. LAB bombing, on the other hand, was done from such an altitude that the bomb's path was approaching the vertical when it reached the target. Such being the case, a direct hit was perhaps not so likely to sink a vessel as was a very near miss. But a direct hit certainly would have caused severe damage.

In all probability, then, the efforts of the SB-24's were not wasted. Tactically, damaging a ship carrying supplies and reinforcements to a Japanese garrison and forcing it to turn back might be just as effective as sinking it.

Until American bases were established in the Philippines, blockade of Japanese positions dependent upon water transportation was the chief function of the 63rd and 868th Squadrons; during the first three months of 1944, the 868th patrolled the New Britain-New Ireland area. When shipping was not located, Rabaul or Kavieng received the unexpended bomb load. During January sinking or damage was claimed in 13 attacks on shipping. Such

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attrition made itself felt, and only five vessels were claimed in February. In March, though anti¹shipping patrols were still flown, no claims were made. Most of the squadron's sorties were devoted to night harassing attacks on Rabaul and Truk, or to serving as day and night pathfinders for bomber units not equipped with radar. ⁴⁸

During the same period the 63rd Squadron of the Fifth Air Force was concentrating upon targets along the coast of New Guinea. The hunting was not particularly good, though ~~ten~~¹⁰ attacks which resulted in damage or sinking were reported during March. During April the chief task, in conjunction with daylight air and submarines, was to maintain a tight blockade of Hollandia, objective of the next amphibious landing. During May searches were generally without result, but bombs were dropped on ~~Baik~~¹ Island before the bombers went home. In June more shipping was found as Snoopers staged through Wakde and searched northward to the Philippines. A convoy was sighted north of ~~the~~¹⁰ Halmeheras¹ on the night of 3 June 1944. The next night ~~ten~~¹⁰ Snoopers staged through Wakde to strike this convoy, and claimed to have sunk ~~two~~² destroyers and to have damaged ~~two~~² cruisers. This claim is like most others in being too optimistic. Actually, only a 1,000-ton LST was sunk in this engagement. It is, however, worthy of note that submarines had good hunting in the ~~Halmeheras~~¹⁰⁻¹⁰⁰⁰⁰ area for several days afterward. It is possible that ships damaged by the Snoopers fell easy victim to submarine torpedoes. ⁴⁹

For the remainder of the summer and during early autumn, shipping

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attacks were rare. A new organization entered the picture, very briefly, when the 418th Night Fighter Squadron, flying B-25's, struck at shipping in the ^{Philippines} ~~Halmehera~~s on several occasions during August. Using 250-¹⁵~~15~~ bombs and 75-mm. cannon by moonlight, this organization claimed hits on a number of merchant ships and barges. 50

With the coming of November and the availability of a staging field on Morotai, shipping in the inland waters of the Philippines became a lucrative target. Covering these waters and the northeast and northwest coasts of Borneo, the 63rd and 868th Squadrons claimed 14 successful attacks on merchant and naval vessels. When shipping was not bombed, airfields in the Philippines, the Celebes, and Borneo received the SB-24's bomb loads.

During December the 868th Squadron concentrated upon bombing oil targets in Borneo, although a few successful attacks upon shipping were claimed. The 63rd Squadron, on the other hand, staged through Leyte from its ^{Anguar} base and struck shipping between Luzon and Formosa. This unit claimed seven successful attacks during the month. Philippine airfields received unexpended bombs. Some aid was received from the 345th Bombardment Group, which attacked shipping off the west coast of Luzon on the night of 27 December 1944 but registered no claims. 51

The 308th Bombardment Group of the Fourteenth Air Force received its first SB-24's in May of 1944. A month earlier, however, this unit had commenced attacks on shipping by daylight. A mission flown against vessels near Saigon ²³ April 1944 sank four ships amounting to 22,000 tons. A pattern for the future was set in this instance when 40,000 tons were

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claimed. During May the SB-24's were used in daylight until the month was nearly over. Between 25 and 31 May ten night patrols were flown over the Formosa Straits, resulting in claims of three ships sunk and one damaged. Japanese records revealed no ships sunk in that area by aircraft in late May.⁵²

During June the group flew 71 sea-searches. Targets were sighted, visually or by radar, on 41 of these sorties, and claims were registered of 16 sunk, ⁵five probable, and ¹nine damaged. Some of these craft may have been too small to have received ^{JANIC}attention in the Army-Navy Assessment, but only one Japanese ship is listed as having been sunk by Army aircraft in the 308th Group's area during June. During July seven ships were claimed as sunk, two as damaged. Apparently only one of these vessels actually went to the bottom. During August six ships were claimed as sunk. In this last instance the claims may have been more accurate than was generally the case; five ships were sunk by Army aircraft in the 308th Group's search area during August.⁵³

The exaggerated claims of September 1944 have already been noted.⁵⁴ During October the 308th Group expended most of its energy scouting for shipping outside the bomb line, where no attacks could be made. Only 3,100 tons of merchant shipping were listed as sunk, though four naval vessels were so claimed. Apparently none of the naval vessels attacked was actually sunk, though they may have been damaged. The reconnaissance flown was very valuable, however, since it resulted in the sighting of two Japanese

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task forces on their way to the Philippines. Reconnaissance continued to absorb a large part of the group's energy during November, but in December claims ran to five ships sunk, three probably sunk, and two damaged. Once again the actual results were much less. If ^{J.P.A.C.} ~~the Army-Navy Assessment~~ was accurate, not more than two vessels were sent to the bottom in these attacks. 55

With the coming of January 1945, all three Snooper organizations were in a position to contribute to the cutting of Japan's communications with her empire. From its staging base at Morotai the 868th Squadron ranged along the coasts of Borneo, striking airfields when shipping could not be found. The 63rd Squadron patrolled the coasts of Luzon and claimed to have damaged several freighters during the month. The 308th Group swept the Formosa Straits and the South China Sea. Attacks on shipping were few in January, but reconnaissance revealed Japanese movements. The same situation continued in February, except that the 63rd Squadron extended its regular patrols westward to Formosa. The squadron was not permitted to attack shipping in this area until 15 February, but for the remainder of the month the SB-24's claimed four small craft sunk and two larger vessels damaged. It was fortunate that the 63rd Squadron was now in position to extend its patrols to the China coast, because Japanese advances had forced the 308th Group to evacuate all but one of its squadrons from the Kunming area. The other three squadrons moved north to Chengtu, out of range of the China Sea.

A glance at the map will reveal, however, that SB-24's ranging from Morotai, Biak, Luzon, and Kunming completely covered Japanese communica-

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tions with the East Indies. When the efforts of day bombers, submarines, surface craft, and mines are added to those of the Snoopers, it is apparent that little shipping could get through. This was made clear in March 1945. In the Borneo area the 868th Squadron reported successful attacks upon 17 vessels. Six of these were claimed as sunk, but a check reveals that only one ship was sunk by army aircraft in this area in March. Farther to the north the 63rd Squadron and the 373rd Bombardment Squadron of the 308th Group made no less than 38 shipping attacks in which sinking or damage was claimed. Claims of vessels sunk, which amounted to 23, were not so excessively optimistic as usual, since 11 naval vessels and 22 merchant ships were sunk by Army aircraft during the month. ⁵⁶

For the next three months, SB-24's continued to find and attack Japanese shipping. No longer were patrols confined to the ~~hours of darkness~~. The black Snoopers droned over the ocean night and day, preventing raw materials' reaching the home islands and cutting off Japanese in the Indies from supplies from home. The 868th Squadron began to slip into East Indian harbors at night while it sought shipping on the open sea in daylight. On the night of 7 May 1945 ten planes of this unit claimed to have scored hits on five vessels in the harbor at Soerabaja, Java. When the Snoopers returned from this mission, they had been airborne more than 17 hours and had flown 2,660 statute miles. The 63rd Squadron claimed successful attacks on 19 ships during May. By the end of June few ships attempted the perilous passage between China and the Philippines, and the SB-24's prepared to move forward again. Sea searches were still going on, but mainly

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by daylight. As the war ended, the 868th Squadron was on Okinawa, ready to strike at Japanese shipping in home waters. ⁵⁷

One way in which the SB-24's, and other heavy bombers as well, struck at Japanese shipping was through mines laid in harbors, canals, and rivers. The 308th Group laid mines night after night in Formosan Harbors, in the main rivers of China, and along the China coast. Mining was also carried out, though to a lesser degree, by B-24's of the Tenth Air Force flying from Indian bases, and by similar Seventh Air Force planes flying from the Marianas. The culmination of ^{AF} ~~Air Force~~ mining came when B-29's of the XXI Bomber Command mined the home waters of Japan, but that program will be considered in another connection. It should be noted, however, that during 1944 and the early part of 1945, before the B-29 mining program had gone into effect, a considerable number of Japanese ships fell victim to mines laid by ^{AF} ~~Air Force~~ planes ~~under cover of darkness~~. By the end of March 1945 at least ⁴ ~~four~~ naval vessels and 22 merchant ships had been sunk by such mines. Mines laid in Chinese waters by the 308th Group accounted for 16 of these sinkings. Five more ships went down as a result of mine explosions in these waters before the end of the war. Probably many more vessels were damaged. When the effect upon Japanese communications of lost and damaged ships is coupled with the loss of time incurred in sweeping, it is apparent that aerial mining had a significant part to play in isolating Japanese garrisons as well as in reducing the supply of raw materials for Japanese industry. ⁵⁸

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The fact that Snooper claims against Japanese shipping were highly unrealistic ~~insofar as ships sunk was concerned~~ makes any evaluation of their contribution to the war amount to little more than speculation. If the crews erred only in reporting damaged ships as sunk, SB-24 efforts were possibly almost as effective as they were thought to be at the time. On the other hand, if the claims of vessels damaged were as inaccurate as the claims of sinkings, then the main effect of the Snoopers was as an harassing agent. As indicated above, though not subject to proof, it seems probable that many ships inaccurately reported as sunk as well as most of the ships claimed as damaged were damaged to some degree. That being the case, then communications between Japan and her outposts were greatly hampered, and the position of the Allied forces was strengthened accordingly.

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V. B-29 NIGHT OPERATIONS

Introduction. It was in the strategic bombing of Japan that the ^{A.F.} ~~Air Force~~ really used night bombing as a policy. The transition to night operations was made somewhat unwillingly, but it was made, and it achieved results far greater than had been expected. In its main phase, this night bombing was merely a further development of tactics and doctrine already practiced by the RAF in its bombing of Germany. It was, to be sure, more effective than British bombing because Japanese cities were not defended so well as German ^{cities} ~~cities~~, because Japanese cities were so built as to be extremely vulnerable to incendiary attack, and because the B-29 was a faster plane than the British heavies, yet capable of carrying a tremendous bomb load.

Nonetheless, the "Fire Blitz," as the incendiary bombing program was called, did not involve radically new tactics or principles. Before the end of the war, however, the Twentieth Air Force had carried out two revolutionary developments. One of these was a program of aerial mine-laying on a scale far greater than had ever been attempted before, and which proved highly effective. Secondly, with improved radar devices, the 315th Wing of the Twentieth Air Force destroyed, for all practical purposes, Japan's petroleum industry with 15 extremely accurate night precision bombing missions.

The story of the Twentieth Air Force must begin with the B-29. The plane had been designed before the outbreak of World War II, and development was pushed through the early 1940's. Since this aircraft was a

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radical departure from previous bombing planes, many problems were encountered in production, but by early 1944 enough of the Superfortresses, as the B-29's were dubbed, were available for a training program to begin.

Without going into technicalities, it can be stated that the B-29 was a four-engined bomber with a radius of action great enough to permit the bombing of Japanese targets from bases in the Marianas or China. A maximum bomb load of ¹⁰ten tons could be carried, but it should be noted that on long-range missions, ²bomb load had to be cut down in order that enough fuel might be carried. For defense against enemy fighters, the B-29 had considerably more speed than the B-17 or B-24, and a computing central-fire-control system which permitted many guns, all aimed by the same hand, to be brought to bear on an attacking fighter. Since it was intended to bomb from higher altitude than previous bombers, it was pressurized, thus adding to the comfort and efficiency of the crew at altitude. In anticipation of bombing through overcast, the B-29 was equipped with AN/APQ-13 radar, an adaptation of the ¹Standard H2X already in use by the RAF and AAF.

The specifications of the plane almost dictated its employment against Japan. Nearly all German targets were within range of British ¹or Italian-² based B-17's or B-24's, but the Allies held no bases from which these bombers could strike the home islands of Japan. But in China potential airfield sites within range of Kyushu and Japan's Manchurian industries were already in friendly hands, and the conquest of the Marianas was scheduled for mid-1944. Therefore it was against Japan, which ¹had gone unpunished throughout the





war, ~~except for the Doolittle raid~~, that the B-29's were to be used.

Night operations from China. B-29 operations began from Chinese bases. The activities of the XX Bomber Command were mainly by day; therefore, ^{it} had little bearing on a history of night operations. On the other hand, the knowledge gained on flights from India and China contributed to the success of the younger XXI Bomber Command's missions from the Marianas.

^{This} ~~Which~~ is not to say that the XX Bomber Command flew no night missions. On the contrary, the first attacks upon the Japanese home islands were flown at night. The target for the first mission was the Imperial Iron and Steel Works at Yawata. Takeoff began at 0930 ^{on} the morning of 15 June. Two pathfinder planes from each of the four groups of the command went ahead of the main body, but each plane made its run individually. Sixty-seven Superfortresses were airborne, but mechanical troubles caused nine aborts. Nine other planes were unable to bomb the primary target, which left 49 planes over Yawata. Bombing altitude ranged from 8,000 feet for some of the pathfinders to as high as 21,000 feet. Thirty-four of the planes to go over the target found it necessary to bomb by radar. Three planes failed to return, but none of these was lost over the target. Ten bombers were damaged.

In all, some 386 x 500-~~IB~~ bombs were aimed at the primary target. Not many of these were effective. Later photographic reconnaissance showed that only one bomb fell within the plant area, and that one some



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3,700 feet from the aiming point. The Kakura Arsenal and the Kyushu Chemical Works were damaged to some extent by bombs which struck from 4,000 to 20,000 feet from the aiming point. Most of the bombs hit business and residential districts.¹

Two other night missions over Japan, and one against Sumatra, were flown before day sorties were sent over the Japanese home islands, Sasebo, Palembang, and Nagasaki being the targets. Twenty-four planes participated in the incendiary attack on Nagasaki, and reports based upon crew observations reached something of a height of exaggerated optimism. "It is felt that this mission was a complete success and that in all probability the entire urban area of Nagasaki was wiped out," chortled one unit history.²

Strategically, the activities of XX Bomber Command were not highly successful. As indicated, it was as pioneers that the planes of this organization contributed the most. They battle-tested the B-29 six months before operations could begin from the Marianas. One pioneering mission was successfully carried out on the night of 25/26 January 1945 when Singapore and Saigon Harbors and Camranh Bay were mined, demonstrating that B-29's could carry out this type of operation. Another contribution to the future was made on the night of 29 March when oil installations on Bukum Island, just south of Singapore, were accurately and destructively bombed by radar methods from 5,000 feet.³ Both mining and radar bombing of oil installations were to be an important activity of the XXI Bomber Command from the Marianas.

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It was inevitable that the main B-29 effort should be launched from the Marianas Islands as soon as facilities were available there because the Marianas were nearer to Honshu targets than the Chinese airfields from which ~~the XX~~ ^{the} Command operated. Moreover, these Chinese bases were at the end of a supply line which ran halfway around the world and over the world's highest mountain range. A sustained offensive from China was impossible, because one mission used up stocks of bombs and gasoline which ~~had been laboriously~~ ^{to be} accumulated ~~by~~ ^{over} several weeks of effort. Also, the China bases were vulnerable to Japanese night bombing attacks, despite the efforts of a night fighter squadron detailed to defend them.

In early 1945 the XX Command ceased all operations out of China and concentrated upon targets within range of its bases in Bengal. Sometimes Ceylon was used as an advanced base for attacks into the Indies. In May the 58th Bombardment Wing, which had been absorbed into the XX Command and then reconstituted, was ordered to the Marianas. The XX Bomber Command ceased to exist as a tactical organization. It had carried out its function of initiating attacks upon Japan and doing the exploratory work for B-29 operations. This pioneering had been carried out at considerable cost; 124 B-29's had been lost, 53 as a result of enemy action.⁴

High-altitude day bombing from the Marianas. In October 1944 the XXI Bomber Command of the Twentieth Air Force came to Saipan with the avowed intention of destroying Japanese productive capacity by high-altitude daylight precision bombing. The training program of the 73rd Bombardment Wing,

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the first wing of the XXI Command to become operational, had been carried out with this end in view, though there had been little truly high-altitude bombing practice. The crews had been trained in radar bombing, but this was thought of as a last-resort measure in case of undercasts which prevented visual bombing.⁵ For four months the command struggled unsuccessfully to carry out a program of high-altitude daylight bombing. In order that the contrast between the day missions of November 1944 through February 1945 and the night missions which came later may be apparent, it will be well to devote some attention to these early missions.

In accordance with accepted doctrine, the Japanese aircraft industry was set up as the first priority target for the B-29's. Therefore, after two shakedown missions against Truk, 27 October and 2 November 1944, and reconnaissance over Japan, the Musashino Aircraft Engine Factory in Tokyo was set up as the target for 24 November. Although 111 B-29's were airborne on this strike, only 44 bombed the primary and two of these were lost. No hits were claimed.⁶

Without describing all the strikes flown in 1944, it can be stated here that ¹⁰ten missions had been flown by the end of December. Only one effort, a small-scale high-altitude attack ^{in, and} on Tokyo, 29/30 November, was made at night. Seven day attacks were made on Japanese aircraft plants, and not one was successful. In all, 689 sorties had been mounted, but only 406 planes had bombed the primary target. Of the bombs dropped on aircraft factories, only 1.8 percent had hit within 1,000 feet of the aiming point. The Masaschino

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plant had been the most heavily attacked. Some 350 sorties had been sent against this factory, carrying approximately 3,500 x 500-lb. general purpose and incendiary bombs. Only 34 of these bombs had struck within the plant area. Yet the ¹⁰ten missions flown had cost 35 planes and 31 crews. This amounted to slightly more than 5 percent of the planes airborne, or 8.6 percent of the bombers over the target.⁷

During February⁷ and the first four days of March, 11 high-altitude day missions were flown over Japan. Results were little, if any, better than they had been in December. The number of abortive planes was high, and losses over Japan reached 6.8 percent⁴ in January. Frequently clouds obscured the briefed targets, making it necessary to bomb urban areas by radar. Even when the target was visible, the bombing was usually poor. For example, out of 429 x 500-lb. GP bombs aimed visually at the Mitsubishi Aircraft plant at Nagoya on 15 February, only 18 hit within a target area 3,000 feet wide and 10,000 feet long. The daylight bombing campaign against Japan was not only a failure, but an abject failure. After 2,000 high-altitude sorties, not a single one of the 11 main aircraft factories in Japan had been destroyed.⁸

Such a complete failure demands an explanation. In January 1945 an operations analyst rendered a report to the Chief of Staff of the XXI Bomber Command on the reasons for poor bombing of Japanese targets. The analyst found that the outstanding fault was failure to reach the initial point. This resulted from a number of factors, but the abnormal 30 percent abortive rate topped all others. Even when not technically abortive, many planes

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failed to reach the IP and bombed targets of opportunity because of fuel shortage. The fuel shortage came about because of personnel failure on the part of pilot, engineer, or navigator. Faulty navigation kept some planes from finding the IP, as did chronic radar malfunction. There were instances, also, when airplane commanders deliberately chose an IP other than the one assigned at briefing.

Even when the bombers had reached the IP, they did not always make the bomb run as instructed. The usual fault was holding altitude higher than that briefed, in an attempt to escape antiaircraft fire. Sometimes this change in altitude was not announced to the bombardier until it was too late for him to change his bombsight data. The bomb-run heading was often merely a theoretical concept; in practice, the planes of a single squadron might vary 60° in their headings. This last matter pointed up the fact that the formation flying was very poor, and this was another reason for bad bombing. Poor formation was due to bad takeoff sequence, weather, and inability of the B-29's to close up from the loose route formation which was flown from assembly point to the initial point in order to save fuel.

Lastly, bomb-release technique was very poor. One cause of this was frosting of the bombardiers' glass surfaces at high altitude. Since it was difficult and sometimes impossible for wing bombardiers in rear elements to see the lead plane, they dropped their bombs when the plane nearest them dropped. Thus there was a cumulative lag in bomb release which resulted in an overlong pattern. Preoccupation with fighters led to the same result.

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In addition to all this, there were frequent breaches of bomb-run discipline. Airplane commanders sometimes ordered bombardiers to "Quit fiddling with that switch and get on the guns." There were even instances of pilots' turning off the bomb run before the bombs were released.⁹

Apparently this analysis was wholly correct so far as it went, but it did not tell the whole story. Had these factors been the only ones to be considered, better and more strictly enforced discipline and harder work by the maintenance crews might have solved the problem. In fact, there was a definite attempt to correct such deficiencies by increased training and improved air discipline, but it was to little avail. Only 12.7 percent of the planes airborne in February turned back without bombing, but only 49.6 percent bombed the primary target. This was only a slight improvement over the previous months. On the mission of 10 February the 498th Bombardment Group had an abortion rate of no less than 33 percent. For the command as a whole, personnel failure was found responsible for less than 5 percent of the abortive missions. In many cases, failure to bomb the primary ^{target} was attributable to weather rather than to any fault of the crews.¹⁰

In fact, ~~the failure of~~ these early missions against Japan ^{failed for a variety} ~~resulted from~~ ^a ~~a combination of factors.~~ One of the chief ^{reasons} ~~reasons~~ for failure was the altitude from which the bombs were dropped. Until March 1945 the B-29's took off from their bases at dawn, assembled in squadron formation over the Marianas, flew a dogleg at medium altitude around Japanese-held islands in the Bonins, then climbed to 28,000 feet or higher before reaching the coast of Japan.



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Actually, bombs were usually released from above 30,000 feet.

The climb to altitude and sustained flight so far above the earth put an intolerable strain upon the bombers' engines. This was the real reason for the high rate of abortive sorties. The evidence in support of this statement is strong. During the first four months of attacks upon Japan the rate of abortions ranged from 12.7 percent to 20.8 percent of all airborne planes. In March, when the B-29's began making their raids at medium altitude, the abortive sortie rate dramatically dropped to 6.9 percent. Eventually, in July, it was to go down to 4.5 percent.

Cooperating with high altitude and the accompanying strain upon engines to reduce B-29 effectiveness was Japanese weather. So bad were the weather conditions over the home islands that good visual bombing conditions were infrequent. Even when the target was visible, icing often made it impossible for the bombardier to pick up the aiming point in his bombsight. Formations were often forced to disperse by frontal conditions between the Marianas and Japan, and it was seldom that all the bombers were able to reassemble before reaching the IP.

The winds at high altitude over Japan were of great velocity -- up to 200 miles an hour. Winds of such strength imposed a tremendous handicap upon bombardiers. If the bomb run was made upwind, ground speed was reduced to as low as 100 miles an hour. This might be good in that it allowed the bombardier a long time for sighting, but it left the formation under anti-aircraft fire and fighter attack for an intolerably long period and, so far as

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flak was concerned, made it an easier target ~~in addition~~. If the bomb run was made downwind, ground speed went up in the neighborhood of 500 miles per hour. Under these conditions, unless the IP was a great distance away from the target, and unless visibility was such that the target could be seen from the IP, the bombardier simply did not have time for proper aiming. If the bomb run was made crosswind, the bombardier was forced to make drift corrections of such magnitude that, even when the bombsight could accommodate the correction, little if any time was left for determining the correct dropping angle. Runs from other points of the compass brought combinations of large drift angles and high or low ground speed.¹²

Two lesser factors contributed to the lack of success of high-altitude day missions over Japan. During this period no less than 25 percent of the AN/APQ-13 radar sets aboard the B-29's malfunctioned at high altitude. This condition was later to be corrected, but it was a definite handicap during the first months of operations. A second consideration was the poor performance of the A-2 bomb rack at altitude. Many bombs failed to hit briefed targets because of rack malfunctions.¹³

There was never any contention that high-altitude bombing was as accurate as bombing from medium or low altitude. On the contrary, inaccuracy resulting from altitude was to be accepted because high altitude supposedly protected bombers from antiaircraft fire and, to a lesser degree, fighters. It would appear that this was not true over Japan. "On several missions, over 500 attacks from 200-300 enemy aircraft were experienced." On the mission

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of 27 January, 56 B-29's reported receiving 984 fighter attacks. Certainly this aerial battle was on a large scale, because nine Superfortresses failed to return and 77 fighters were claimed as destroyed. By the end of February, 33 B-29's had been lost to fighter attacks or unknown causes, and it was presumed that most of those whose fate was unknown had also been shot down by interceptors. In addition, some 103 bombers had been damaged by fighters.¹⁴

Nor did high altitude offer ~~any great measure of~~ protection against flak. No less than 145 of the planes over Japan on the first 17 missions suffered damage from antiaircraft fire. This amounted to 12 percent of the airborne sorties and a considerably higher percentage of the planes which bombed the primary targets. The number of planes damaged from all causes was 310. The 313th Bombardment Wing, which went into action in February and sent out 205 sorties before the end of the month, suffered damage to no less than 70 planes.¹⁵

In considering the loss rate of the XXI Bomber Command before March 1945, it must be remembered that Iwo Jima was still in Japanese hands. The fact that no advanced base was available "forced crews to ditch aircraft which otherwise would only have been battle damaged." Iwo Jima was captured in March, and before the end of the war some 2,396 B-29's made emergency landings there. If only half of these planes had been forced to ditch, they would have amounted to more than 4.5 percent of the sorties flown between February and the close of the conflict.¹⁶



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Crews were well aware of the relatively high loss rate suffered during these early months of operations. While they might not be aware of or greatly impressed by losses for the entire command, they could themselves count the planes which were missing from their groups. The 500th Group lost 11 planes and 45 men killed or missing during January. This was a loss of one plane for every ten sorties and one crew for every 26 sorties. During February five more bombers failed to return to this organization. Even harder hit was the 497th Group, which lost 13 planes and 129 men in January alone. 17

A high loss rate might not have adversely affected morale if the men had believed that their efforts were worth while. But they knew, on the contrary, that they had accomplished very little. Morale was definitely low. ~~Loss rates and the command's failure to bomb effectively were the chief reasons for this condition, but~~ the fact that no rest program and no definite tour of duty had been established added to the discontent. Considerable bitterness was expressed in January when crews read in the service paper Midpacifican that Seventh Air Force B-24 crews were rotated after 40 missions against Iwo Jima. This impressed the B-29 flight personnel as highly unfair, because a XXI Bomber Command crew which bombed Iwo Jima as a target of last resort received no mission credit. 18

Night incendiary attacks against main urban centers. Since high-altitude day bombing had proved a failure, some new tactic had to be attempted if the strategic bombing of Japan was to be carried out. The answer was at hand.

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As early as July 1944 the 40th Bombardment Group had reported after taking its B-29's over Japan: "Apparently the enemy is not yet prepared to offer too effective defenses against . . . night bombing." Also, planes flying weather reconnaissance over Japan at night reported that "Japanese night defenses were entirely inefficient during the period." When Japanese night fighters were airborne, reported the 497th Group, "they never found our aircraft, but seemed to fly around blindly firing an occasional burst of tracers, as though trying to draw return fire, so that it [sic] could locate our craft."¹⁹

Since Japanese night defenses were weak, night bombing was indicated as a possible solution to the problem. Since it was unlikely that individual industries could be located and accurately bombed at night, incendiary attacks upon cities seemed most likely to succeed. A study of incendiary bombs suitable for use against Japanese cities had been going on since 1943, and it was well known that the urban areas were highly inflammable. Already four incendiary attacks had been mounted, one at night; none of them had been successful, but their failure was believed to be "due to the small number of aircraft participating, insufficient bomb tonnage, and weather difficulties experienced at high altitude." By early March the number of planes over the target could be largely increased. Until February only the 73rd Wing, with an average strength of 125 planes, was available for operations. During February, however, the 313th Bombardment Wing and part of the 314th arrived in the Marianas, and by 9 March the XXI Bomber Command had 385 planes available.²⁰



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A left-handed endorsement of a program of incendiary attacks came from General Arnold in February. As commander of the Twentieth Air Force, Arnold reaffirmed the status of the main Japanese aircraft factories as targets of highest priority, but at the same time authorized fire bomb attacks against urban areas as a diversion. The "Fire Blitz" which ensued was certainly one of the greatest diversions in military history.²¹

To avoid weather difficulties at high altitude, as well as to increase bomb load, it was determined that for night attack bombing altitude would be brought down to less than 10,000 feet. To further increase bomb load, all guns were removed from the turrets and, of course, no ammunition was carried. After the first mission, the tail guns and 200 rounds of ammunition were restored, but this was the only defensive armament normally carried on night missions for the remainder of the war.²² The explanation of the new tactics given in the XXI Bomber Command history, while it glosses over the fact that the previous attacks had failed, is worthy of attention.²³

The five incendiary raids of March represented a radical departure from the tactics hitherto employed by the XXI Bomber Command. The customary techniques were reversed; night instead of daylight attacks; low altitudes instead of high altitudes; all incendiary instead of mixed loading; area instead of factory targets; single aircraft instead of formation flying. This change was a shrewd and daring manoeuver designed to catch the Japanese off balance, capitalize on their inadequate night defenses, and destroy by fire the highly concentrated heart of the Japanese Empire.

The decision for this abrupt shift in tactics was dictated by more than a desire to surprise the Japanese defenses. A number of astute considerations, based on the accumulated experience of

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the XXI Bomber Command in the field, decided the issue. What had been learned over a period of three and one half months of battling Japanese fighters, flak, and weather was added to what was known of the inflammability of Japanese cities. The result was revolutionary.

In lowering the bombing altitude from 25,000 - 30,000 feet to 5,000 - 9,000 feet, the mission planners gained the advantages of greater accuracy and increased bomb loads. Winds with a velocity of 120 to 180 knots, which had handicapped bombing accuracy at high altitudes, were only a negligible 25 to 35 knots nearer the ground. Cloud coverage was less of a hindrance. Errors in computing the variables of bomb sighting were less with the decrease in the distance of bomb travel. Better radar scope definition led to better navigation and easier location of aiming points. Reduction in the strain on engines involved in climbing to high altitudes meant easier maintenance. Most important of all, lower altitudes enabled heavier bomb loads. In the laborious climb to altitude the B-29 engines consumed large quantities of fuel. Munitions were now substituted for this fuel, with the result that bomb loads leaped upward to about 14,000 pounds per aircraft.

To have used the lower altitude in a daylight attack would have exposed the B-29's to murderous fighter and anti-aircraft fire; so the mission planners timed the raids to occur after dark. The inefficiency of Japanese night fighters had been evidenced by the success of nightly weather-strike sorties. Therefore formations could be dispensed with and ammunition eliminated from all except the tail turrets. Japanese searchlight equipment had likewise been proved to be relatively inefficient. Flak analysis had indicated that the Japanese depended upon visual contact for anti-aircraft control. Radar control, where used, was relatively inefficient. It was also known that Japanese automatic weapons were ineffective at 5,000 feet and their barrage balloons were moored below that level. These weaknesses added to the probability of success in the new technique.

The Fire Blitz began on the night of 9/10 March 1945. "Crews at briefing shook their heads in amazement. Most felt that at such low altitude the big B-29's would be easy marks for the numerous flak installations at Tokyo7." Although 325 planes took off, only 279 bombed the assigned urban area of Tokyo. Twenty-six aircraft were abortive, and 20 bombed other targets. The mission was costly; 14 B-29's were lost and 42 damaged, but

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Tokyo was turned into a flaming inferno. Photo-reconnaissance revealed that 16.7 square miles of the built-up urban area had been burned to the ground. The crews who had been so dubious at briefing, now "having seen the tremendous flames, were anxious for more of that sort of raid --- especially since Jap resistance was unexpectedly light. Night fighters had flown around aimlessly, while searchlights waved wildly around, and failed to pick up most of the bombers."²⁴

Beginning with the night of 9/10 March, XXI Bomber Command operations may be divided into eight phases. The raid of that date was the beginning of an incendiary campaign against the main urban centers of Japan, a campaign which was concluded 15 June. Between 23 March and 4 April six experimental night missions were sent against precision targets. From 7 April until the end of the war precision attacks were made against industrial targets by day from medium altitude. Beginning 27 March the 313th Wing carried on a highly successful mining campaign which continued through the last night of the war. From 17 June until the night before the surrender an incendiary operation was carried out against secondary Japanese cities. Tactical missions in support of the Okinawa invasion were flown against airfields on Kyushu by day from 17 April until 18 May. These strikes also were flown by day. From 26 June until the end of the war night precision bombing came into its own as the 135th Bombardment Wing smashed the Japanese oil industry. The last phase involved the two atomic bomb attacks which destroyed Hiroshima and Nagasaki.²⁵

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This study need not concern itself with the day precision missions against industry, the tactical attacks upon Japanese airfields, or the atomic bomb drops. It may be noted, however, that when the B-29's came down to medium altitude, that is to 20,000 feet or less, for their day missions, bombing accuracy was greatly improved. Furthermore, when bombing was done from medium altitude, a higher percentage of airborne sorties reached the primary targets, and losses to flak and fighters were little more than they had been at high altitude. Indeed, fighter opposition ceased to be a serious factor before the end of the war.

During March the campaign against the main urban centers continued without letup. On the night of 11/12 March some 285 planes roared over Nagoya. The only loss resulted from a crash on takeoff. Results were poor as compared to the previous mission; only 1.56 square miles of the city were burned out. However, no mission prior to 9 March had accomplished this much. Two nights later Osaka was the target for 274 planes out of 298 airborne. More than eight square miles of the city was reduced to ashes at the cost of ~~two~~ bombers lost and 13 damaged. A curious note was sounded by the 500th Group, which reported that several planes on this mission were observed to drop their bombs into the bay at landfall and turn back toward base.²⁶

Kobe was the target for the night of 15/16 March. Of 331 B-29's airborne, 306 reached the primary. Three bombers were lost on this mission, and 11 were damaged. Two and one half square miles of the city were



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destroyed.) The 313th Wing reported sighting some 210 Japanese aircraft, on this mission, and underwent 63 attacks. Most of these passes, as had been expected, came from the rear. Two 313th Wing B-29's were among those lost. On the night of 18/19 March another raid was mounted against Nagoya. Although 290 aircraft bombed the primary, only .65 square mile of the urban area was destroyed. Because Nagoya was strung out along the coast line, it was a very difficult target. Twenty-eight planes were damaged on this mission, but only one was lost.²⁷

Although the results of the two missions against Nagoya had been disappointing and the destruction at Kobe less than had been hoped for, the overall results of the first five missions of the Fire Blitz were gratifying. "In these ten days, the XXI Bomber Command with an average of 380 assigned aircraft flew 1,595 sorties (75% as many as had been flown in the preceding 3 1/2 months), delivering 9,365 tons of incendiary bombs (3 times the tonnage dropped in the preceding 3 1/2 months), at a cost of .9% of the participating crews, the lowest loss rate yet attained." Moreover, concrete results were evident in more than 30 square miles of destruction in Tokyo, Kobe, Osaka, and Nagoya.²⁸

As might be expected, morale rose. The 499th Group reported: "the most outstanding month in the history of this Group, not only from the standpoint of 'bombs on the target' but also the 'esprit de corps' with which all members worked." The 19th Group was content to describe morale as "considerably higher during March." Crews of the 498th Group "were

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enthusiastic in their approval of this type of mission and almost speechless in trying to describe the flaming devastation they had witnessed in Tokyo. " The 313th Wing also noted higher morale. "This may be ascribed chiefly to the success with which the Wing executed its mission, for photographs of burned Japanese cities represented a concrete accomplishment . . . "29

The campaign against the major cities continued through the next three months, though not at the pace set in March. Tokyo remained the target in April, suffering an additional 15.9 square miles of destruction, while almost three square miles were burned out in neighboring Kawasaki. A new tactic was featured when 18 tons of fragmentation bombs were mixed with the incendiaries as a deterrent to fire fighters. 30

After an interruption due mainly to the necessity for bombing airfields in Kyushu, the blitz against major cities was resumed with day and night attacks against Nagoya in mid-May. Two more night missions, both directed against Tokyo, were flown the nights of 23/24 and 25/26 May. In all, 984 B-29's rained incendiary bombs on Tokyo during the two attacks. Since on previous missions smoke from fires set by the first planes over the target had proved an obstacle to visual bombing by succeeding aircraft, the pathfinders on the night of 23/24 May were ordered to bomb the easternmost edge of the target area so that the planes which followed could aim short of a definite, visible aiming point. The two missions burned out an additional 18.6 square miles of Tokyo, but the cost was high. Tokyo's defenses had been strengthened a great deal, with the result that 17 B-29's were lost the

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first night, 26 the second. On the two nights no less than 180 Superfortresses were damaged.³¹

Presumably all these losses were due to antiaircraft fire or operational causes, but there were many reports of night fighters in the air. Fighters equipped with a powerful searchlight in the nose had been reported over Nagoya earlier in the month, but there was no note of such planes over Tokyo. Searchlight and antiaircraft defenses were greatly improved, however. An error in tactics may have contributed somewhat to the high losses on 25/26 May. On this mission pathfinder aircraft were sent in at 5,000 feet on an upwind heading. This tactic exposed these highly trained crews to murderous antiaircraft fire. The 58th Wing lost ~~three~~ of its 12 pathfinders as compared to 6.6 ⁷ percent of its remaining aircraft.³²

Because of the high losses incurred on these two missions, and because the defenses of the major cities were expected to become still stronger, it was determined to complete the destruction of these cities by day from high altitude. A factor encouraging this decision was the topography of the unburned areas of Kobe, Osaka, and Yokohama. They lacked outstanding features needed for good radar targets, ~~so~~ visual bombing was preferred.³³

The new tactic was used on five missions which began 29 May and ended 15 June. In all, 2,537 sorties were sent out, and more than 14 square miles of the three cities ^{was} added to the areas already in ashes. The entire campaign against five cities, if Kawasaki may be considered as part of the Tokyo urban area, had burned out 105.3 square miles. Of the 110.8-square-mile

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total area of Tokyo, 56.3 square miles were destroyed. In Nagoya 12.4 square miles out of 39.7 were levelled, as were 8.8 square miles out of 15.7 in Kobe. Osaka suffered destruction of 15.6 out of 59.8 square miles, and Yokohama lost 8.9 out of 20.2 square miles. Designated target areas amounted to 106 square miles, and 102 square miles were destroyed. In short, almost 42 percent of the total built-up area of the five target cities had been burned to the ground. The ethical and strategic wisdom of this campaign may have been open to question; its brilliant success as a military operation was indisputable.³⁴

Since some of these attacks were made by night, some by day, a comparison is possible. ~~Technically,~~ since two missions were considered flown against Tokyo on the night of 15/16 April, 11 night missions and six day missions were flown. Of the 3,854 sorties airborne on night missions, 3,505, or 91 percent, bombed the primary target. Of the 3,068 day sorties, 2,710, or 88.3 percent, bombed the primary. At night 87 planes were lost, amounting to 2.25 percent of the airborne sorties. Planes damaged at night numbered 412, or 10.6 percent of airborne sorties. In daylight 43 planes were lost and 582 damaged, amounting to 1.4 percent and 18.9 percent respectively. Night missions destroyed more than three times the area credited to day missions.³⁵

As had previously been the case, a higher percentage of night sorties bombed the primary target, but the difference was not nearly so great as it had been earlier when day missions had been flown at 30,000 feet. The

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higher loss rate at night can be attributed to the fact that Tokyo, the most heavily defended target, was always bombed at night. Seventy-seven planes were lost over Tokyo out of 2,083 night sorties, while only ¹⁰ten were lost over the other cities out of 1,171 night sorties. Indeed, the loss rate over cities other than Tokyo was only 0.5 percent, little more than one fifth the loss rate over those cities in daylight. A comparison of damage rates bears out the contention that day missions were more hazardous than those flown at night. The day damage rate, as noted above, was 18.9 percent of exposures. The overall damage rate at night was only 10.6 percent, but over cities other than Tokyo it was only 5.2 percent, much less than one third the day rate over the same cities.³⁶ Since day raids on Kobe, O^asak, Yokohama, and Nagoya suffered more loss and damage, in proportion, than night raids on the same cities, it seems reasonable to conclude that had mass raids been made on Tokyo by day, the loss rate would have been at least three times as high as that suffered at night. Had day raids over Japanese cities not been escorted by this time, losses would probably have been higher than they were.

Experimental night precision bombing. Beginning the night of 23 March 1945, attempts were made to precision-bomb Japanese industrial installations by night. The success of the first night incendiary missions apparently raised hope that factory targets might likewise be destroyed after dark. Therefore 251 planes were sent against the Mitsubishi Aircraft Engine Works at Nagoya for the first trial.

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The mission was elaborately planned. Ten bombers carried flares which they were instructed to drop at intervals, so as to keep the target illuminated for 30 minutes. These flares, dropped from 7,800 feet, were set to ignite at 3,000 feet. Ten other planes carried a bomb load of M-17 incendiary clusters with which to set fire to the factory. The remaining B-29's carried a load made up of 500-lb. GP bombs plus two 500-lb. M-76 incendiaries, which had the same ballistics qualities as the quarter-ton general purpose bomb, per plane. So that damage and accuracy might be recorded and as much information as possible gathered, several of the bombers carried cameras and photoflash bombs.

The strike did not go as planned. The glare from the flares hindered bombardiers as much or more than the illumination helped them. Four-tenths stratocumulus clouds with bases at 3,000 feet and tops at 7,000 feet were perfectly positioned to interfere with bombing. Not all the incendiaries dropped hit the target by any means, and many bombardiers aimed their bombs at misplaced incendiaries. Smoke soon reduced visibility from 15 to two miles. The 223 planes which bombed succeeded in damaging only 4.4 percent of the roof area of the plant at a cost of five B-29's lost and 44 damaged.³⁷

On the night of 29/30 March 14 planes of the 19th Bombardment Group returned to the same target. No incendiaries were carried on this mission. The first, fifth, and ninth bombers over the target carried flares; the remainder carried high explosive bombs. Only 12 crews bombed, and they

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were forced to release their bomb load by radar when they found the target completely obscured by clouds. No planes were lost, no results were observed, and, apparently, no damage was done.³⁸

The frequently bombed but seldom damaged Musashino Aircraft Plant in Tokyo was the target for 121 B-29's on the night of 31 March. The plan this time was for each plane to release, in addition to its bombs, four flares which would illuminate the target for the next bomber's run. Also, to prevent smoke's hampering visibility, the first planes over the target dropped bombs with delayed-action fuses. The 115 Superfortresses which reached the primary found the plant partially obscured by ground haze, and the reflection of the flares on this haze further reduced visibility. Six planes were lost, but "No visible damage was reported."³⁹

Three more attempts at night precision bombing were made on the night of 3/4 April 1945. The Shizuoka Aircraft engine works, the Najakima Assembly Plant at Koizumi, and the Tachikawa Aircraft Plant were bombed by 48, 43, and 61 B-29's respectively. It is noteworthy that 68 planes failed to bomb primary targets on these missions. There were no plane losses, but damage was inflicted on 21 B-29's while none was inflicted on the assigned targets.⁴⁰

With the failure of these last three missions, night precision bombing was abandoned for the time being. Flares had failed as an illumination device over Japan as they had failed so often elsewhere. "Although the APQ-13 radar could bring the flare aircraft over the target, insufficient

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illumination was provided by available flares to permit bombardiers to see the target through the . . . bombsight. Two items were needed: a suitable target marker bomb and the reflex type bombsight optics . . . and since no target markers were received prior to the end of the war, this type of attack was never again employed . . . ⁴¹

The B-29 mine-laying campaign. One of the most successful operations of World War II was the mining campaign carried out by the 313th Bombardment Wing of the XXI Bomber Command. Apparently this program had its inception as a means of keeping the remnants of the Japanese fleet away from Okinawa, but it quickly developed into a true blockade of Japan. There were three overall objectives: to prevent the importation of food and raw materials into Japan, to prevent the movement and supply of troops from Japan, and to disrupt shipping in the Inland Sea. More specifically, the operation was intended to blockade the Shimonoseki Straits, through which must pass 80 percent of Japan's merchant shipping, to blockade Tokyo, Nagoya, and other important ports on the Inland Sea, and, before the end of the war, to interdict shipping between Japan and Korea by mining harbors on the north shore of Kyushu and on the Korean Peninsula. To carry out these objectives, 1,614 mining sorties were flown, and more than 12,000 mines were laid. It was not an extravagant assertion when the XXI Bomber Command unit history said that "Never before had aerial mining on such a scale and with so bold an aim been undertaken." The results were at least equal to expectations. After April 1945, 50 percent of all the Japanese shipping sunk fell prey to



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mines laid by the 313th Wing.⁴²

The tactics of B-29 mine-laying were simple in conception, though a great deal of skill was required in their execution. Each plane was assigned a definite spot in which to lay its "string" of mines. The Superfortresses took off in the day so as to reach their drop zones at night, navigating by radar. In most cases the instant proper for mine release could be determined by radar, because in the Inland Sea two or more points of land were almost always reflected in the radar scope. Reasonably accurate pinpoints of the plane's position could be determined by "lines of sight" to these known points. When the drop zone could not be located in this wise, a timed run from some nearby known point was almost as effective. In fact, both methods were almost always resorted to in practice, because one served as a check upon the accuracy of the other.

The planes flew at 5,000 to 8,000 feet when releasing mines. Practically no opposition was met on the earlier missions, and although loss and damage increased somewhat as the campaign progressed, the cost was never high. Both magnetic and acoustic mines were carried, and a few highly secret "unsweepable" mines were laid before the end of the war. Both 1,000-^{lb.}~~lb.~~ and 2,000-^{lb.}~~lb.~~ sizes were dropped, the choice depending upon the depth of the water. Since photographs were taken of the radar scope at the time of release, an accurate account could be kept of the areas mined. Many zones were mined again and again, because the Japanese used suicide tactics to open channels in crucial areas. This defensive gambit was checked in part

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by using some mines equipped with counting devices which might let one or more ships pass over unharmed and then explode beneath the next. Even so, it was believed that the life of a mine field was only three or four days when suicide sweeping tactics were used.⁴³

The first two mining missions were run 26/27 and 29/30 March. Shimonoseki Straits and the Suo-Nada area were the objectives the first night, Moji, Kurc, ~~Shimonoseki Straits~~ Hiroshima, and Sasebo areas the second night. Suo-Nada was a secondary area on the second mission. Each of the 200 planes airborne was, of course, assigned a specific drop zone in one of these areas. Each B-29 carried six 2,000-lb. mines or a dozen 1,000-lb. mines. On these missions the primary targets were mined by 177 of the Superfortresses, and 1,645 effective mines were laid. Losses were higher than they were to prove on many later missions, amounting to five bombers (2.5 percent) lost and nine (4.5 percent) damaged. Crew casualties were 47 in number.⁴⁴

Five mining missions were flown during April, but they amounted to only 45 effective sorties out of 57 airborne. These sorties were devoted to reinforcing or plugging holes in the fields already laid and involved the placement of only 368 mines. Apparently missions of 9/10 and 13/14 April closed Shimonoseki Straits until late in the month. "There were several evidences of beached and damaged vessels. . . . All of Hiroshima Bay and large areas in the western part of the Inland Sea were closed to shipping during most of the month."⁴⁵

The effectiveness of this mining program was attested to by Japanese records. Merchant ships were not the only victims during April. A

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submarine, RO 64, struck a mine and went down off Hiroshima on 4 April, and on the same date a sister ship, RO 67, suffered the same fate in Bingo-~~Bay~~ Bay off the coast of Shikoku. The 900-ton frigate Makuto went down in Shimonoseki Straits^y on the same day. Beginning with the 880-ton Yambishi Maru, which sank^y 3 April, 11 merchant ships were sunk before the end of the month. All but one of these went down in the Shimonoseki Straits^y. The 8,426-ton Teizui Maru, which struck a mine^y 18 April, was the largest of these vessels. In the aggregate, mines laid by B-29's sent 23,721 tons of Japanese shipping to the bottom during April 1945. 46

The mining program continued apace in May. Two missions, 3 May and 5 May, mined 11 areas. On these missions 201 B-29's were airborne, and 174 of them laid their mines in the designated areas. No losses and no damage were suffered on these flights. Effective mines laid amounted to 1,422. New fields were mined by eight missions flown from 13 May to 27 May. "By extending the mining effort to all mineable areas in the Inland Sea, the enemy's shortage of minesweeping equipment would be exploited and the areas interdicted." On these flights 220 sorties were airborne, and 190 Superfortresses placed their mines in the designated areas. The number of effective mines dropped came to 1,297. The XXI Bomber Command's tactical mission report on these drops noted that the Japanese had opened a 2,000-foot channel in Shimonoseki Straits^y by suicide tactics, "because of food shortages occasioned by burning of the urban areas." It was estimated that 53 mines in the channel on the eastern approach to the straits^y had sunk

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or damaged 25 or 30 ships.⁴⁷

The XXI Bomber Command was optimistic in regard to the results of its mining program, but it seems likely that the operation was successful beyond expectations. During May no less than 61 merchant ships were sunk by aerial mines in Japanese waters. These ships had a combined tonnage of 141,792 tons. Undoubtedly, many other vessels were damaged. More than half of those sunk were mined in Shimonoseki Straits, some 33 vessels of almost 70,000 tons. Minefields on the approaches to Osaka and Kobe also yielded a good harvest. Fourteen ships of 35,000 aggregate tons were destroyed in this area. Eight ships of 24,107 tons total were lost off the northwest coast of Kyushu, and two ships, one of 3,000, the other of 6,000 tons, were mined off Hiroshima. Four small cargo carriers were sunk by mines in other fields. It is significant that of the 33 ships sunk in the straits, 19 went down on 24, 25, and 26 August. In addition to the above, three small naval vessels, including a minesweeper, a sub chaser, and a frigate, also fell victim to aerial mines during May.⁴⁸

During the remainder of the war, 29 more mining missions were mounted. During June and the first week of July, 429 sorties set out, and 371 Superfortresses laid 3,460 mines ~~in designated areas~~. During the rest of July and the first weeks of August 423 bombers out of 507 sorties laid 3,564 mines, ~~in the intended zones~~. During all these operations only ⁷ seven planes were lost, and only 22 were damaged. Some of the losses were operational, and only 40 casualties were reported. Several times during this space of time

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mine-laying B-29's found themselves being "escorted" by a Japanese plane which apparently went along to spot the area where the mines were laid.⁴⁹

The total number of merchant ships sunk by B-29-laid mines in June was 57, four less than in May. Tonnage was down even more, to 112,310 tons, indicating that smaller ships were being destroyed. Shimonoseki Straits^g was still the most profitable area by far; in those waters and the approaches 38 vessels of 75,000 tons were added to those already on the bottom. The northwest coast of Kyushu yielded ³eight ships of 10,400 tons, and the narrow passage between Shikoku and Honshu northwest of Takamatsu was the scene for the fatal mining of five ships aggregating more than 10,000 tons. Three ships were sunk in Nanao Bay, a 10,000-tonner among them, for a total of 13,000 tons. Three other craft, 3,398 tons in all, were destroyed in other areas. Two naval vessels, a destroyer and a sub chaser, completed the month's bag.⁵⁰

During July aerial mines ^{destroyed} three destroyers and a sub chaser, and mine damage combined with attacks by army and navy aircraft ended the career of a 17,000-ton escort carrier. Sixty-three merchant vessels with a combined tonnage of 146,994 tons fell victims to mines. Thirty-two of these ships, 68,570 tons, went down in Shimonoseki Straits^f or its approaches. Four ships of 5,358 tons were sunk off northwest Kyushu, four of 12,661 tons in the passage between Honshu and Shikoku, and three in the Kobe-Osaka region amounting to 10,585 tons. A shift of emphasis toward the north was demonstrated by the sinking of seven ships of 10,636 tons off Niigata, and the demise of three more in Korean waters, amounting

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to 5,872 tons. Ten more merchantmen, aggregating more than 33,000 tons, were sunk in various other areas, most of them on the north or northwest coast of Honshu.⁵¹

Only 15 ships, none of them naval vessels, were sunk by B-29-dropped aerial mines during the last two weeks of the war; they aggregated 36,164 tons. The Japanese had almost given up trying to use Shimonoseki Straits. Only one small vessel was mined in the straits proper, two others on the eastern approaches. Together they amounted to only 2,500 tons. The Kobe-Osaka area yielded four ships of 13,643 tons, and an equal number of smaller craft sunk in Korean waters came to 8,575 tons. Four others, totaling 11,416 tons, went down off the north coast of Honshu.⁵²

In 4 1/2 months of mine-laying the 313th Wing had sunk 12 small naval vessels, contributed to the sinking of an escort carrier, and sunk 207 merchant vessels with a combined tonnage of 460,981 tons. Unfortunately, no information is available as to the number of ships damaged. From the beginning of April until the end of the war only 279 merchant vessels of 490,121 tons were sunk by all other means -- $\frac{1}{2}$ army and navy aircraft, submarines, surface vessels, mines laid from the air by other organizations, and ordinary marine casualties. This B-29 mine-laying campaign had been achieved at a remarkably low cost. Of 1,614 sorties airborne, 1,380 had laid 11,756 mines in the designated zones. Only 17 bombers were lost; only 39 were damaged; and only 117 casualties were inflicted on the men who flew them.⁵³

Incendiary attacks on secondary cities. By mid-June 1945 the major cities

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of Japan were so gutted that the areas still unburned were not profitable targets for night incendiary missions. Yet, by this time, the Twentieth Air Force had on hand in the Marianas enough B-29's to launch 500 sorties in a day's time. Incendiary tactics as used on the larger cities had proved highly successful, so it was only natural that other targets for similar missions should be sought. 54

The major cities of Japan having been destroyed, the command shifted the assault to the small urban centers. On the three nights before the end of the month [June] eleven cities were raided with excellent results. . . .

The tactics used on these missions were of the usual pattern for night attack. The mean bombing altitudes varied from 7,500 to 10,000 feet. The aircraft attacked singly, bombing by radar. Enemy air opposition was practically nonexistent. The small cities proved to have meager flak and searchlight defenses.

The fact that no new tactics were used for these attacks on secondary cities makes it unnecessary to describe the missions in detail. Some 8,014 sorties were flown as part of this campaign, and 58,184 tons of incendiary bombs were dropped. The damage to 52 of the cities was great enough to be classified as "substantial destruction," while the ~~six~~ remaining towns were considered partly destroyed. In all, 76 square miles of urban area were reduced to ashes. The price paid in planes lost was slightly less than 0.25 percent, and personnel losses were lighter than this because the crews of many ditched planes were rescued. The defenses of the secondary cities were so weak, in fact, that leaflets warning the population of attacks to come were dropped before the end of the war. 55

Night precision bombing of Japanese oil installations. One other phase





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of B-29 operations, night precision bombing of the Japanese oil industry, was an important development in the waning days of the war. The 315th Wing, the last to arrive in the Marianas, had been equipped with APQ-7 radar before the organization left the United States, and had been trained in high-altitude day bombing. On the basis of a curious idea that fighters could not attack a B-29 at 35,000 feet except from the rear, all guns except those in the tail turret had been removed from the planes assigned to the wing. Training for high-altitude day bombing had been thorough, including simulated missions from Jamaica and Puerto Rico against targets on the northeastern coast of the United States. In anticipation of bombing through clouds, training had emphasized radar bomb aiming.⁵⁶

When the 315th Wing arrived in the Marianas, it was considered unwise to send the stripped B-29's over Japan during daylight. Since the Wing was to fly at night, it had no need of great altitude, and its attacks were eventually made at 15,000 feet or below. The Japanese oil situation was almost certainly perilous, because the shipping routes to the East Indies were practically interdicted. Therefore, it was determined that the 315th Wing should use its special radar equipment for high explosive attacks upon Japanese oil installations at night from medium altitude. The XX Bomber Command had had excellent results from a radar attack on Bukum Island, off Singapore, earlier in the year using APQ-13 radar. Results as good or better could be expected from the 315th Wing's improved equipment.⁵⁷

AN/APQ-7 radar had been designed specifically for blind bombing. It



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differed from the standard APQ-13 in that instead of giving a 360° scope picture of the terrain beneath the airplane on which it was mounted, the beam covered only a narrow sector along the heading of the bomber and extending 60° to either side. Thus the scope revealed a fan-shaped section ahead of the bomber only. Because the energy of the set was concentrated upon a smaller area, APQ-7 radar had some ¹⁰ times the power of definition of the older type. This meant that the features of the terrain below and ahead of the attacking bomber were much more easily discerned by the bombardier, making it possible for him to bomb more accurately. In combat the APQ-7 proved able to put 30 ⁹ percent of the bombs dropped within 2,000 feet of the aiming point, as compared with 18 ¹ percent for the older set. Moreover, aiming points which could not be located with the APQ-13 could be used with the APQ-7. Finally, since its beam was concentrated forward along the path of the airplane, the APQ-7 permitted a 70-mile bomb run, with all the advantages coming from more aiming time, as compared to a 33-mile run for the APQ-13. The outstanding success which this device achieved in combat must have proved surprising to some people at Orlando, because an AAF Tactical Center report of 6 March 1945 had concluded that AN/APQ-7 was not so well suited for blind bombing as AN/APQ-13.⁵⁸

The 315th Wing flew 15 missions against ⁷ nine targets. The first of the targets was the Utsube Oil Refinery. The initial attack upon this installation was delivered by 38 planes on the night of 26/27 June. The results of this first mission were only fair in the light of later accomplishments, though

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excellent when compared with the high-altitude daylight attacks early in 1945. Ten small tanks and one large crude storage tank were destroyed, and almost a third of the roof area of the plant showed signs of damage. The plant was believed to be still operational, however, and after other missions the wing returned to Utsube on 9/10 July. This time ⁷seven storage tanks were destroyed, and 11 hydrogenation buildings were damaged. The combined damage and destruction from the two missions was considered sufficient to keep the plant out of production for several months, and it was not bombed again.⁵⁹

Roughly the same pattern emerged in attacks upon the Nippon Oil Refinery at Kudamatsu. Again two attacks were made, 91 B-29's participating in the two raids, the first 29/30 June, the second 15/16 July. The first mission did comparatively little damage, but after the second assault the plant was considered completely inoperative. Less than half of the original storage capacity remained usable, 10 percent of the refining units were utterly destroyed, and the remaining refining units were heavily damaged. Moreover, there was considerable damage to adjacent factories.⁶⁰

The Maruzen Oil Refinery was the target for two successive missions, 98 planes in all, 2/3 July and 5/6 July. The first of these was the third mission the wing had flown, and, like the first two, was not outstanding. Even so, in the neighborhood of 10 percent of the roof area of the refinery showed signs of damage. With its second trip to the Maruzen Refinery, the 315th Wing demonstrated the accuracy which General Spaatz was to describe as "greater . . . than by the best visual means." Photo-reconnaissance

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revealed that the second mission's 500-pounders had left 95 percent of the refinery devastated. ⁶¹

The wing next turned its attention to the Kawasaki Oil Complex, which was really three adjacent plants covering a large area almost within Tokyo. The first attack was delivered on the night of 12/13 July. ^{in which 53} Fifty-three aircraft bombed. The mission was planned so as to bring the bombers over the target in the shortest possible time, and the plan succeeded to the extent that 42 B-29's released their bombs within 23 1/2 minutes. Even so, two bombers were lost to flak. This mission was entirely successful, since 6 percent of the storage capacity of the complex was put out of production, and no less than 37 of the actual production units were damaged. The plant was presumably still operational, however; it was too large to be put out of action by a single attack.

The bombers returned to Kawasaki the night of 25/26 July. Again the flak was heavy, although only one Superfortress was lost on this occasion. Seventy-seven aircraft bombed on this mission, and photographs revealed very substantial damage. Very few buildings or installations in the area had escaped unscathed, and the storage capacity was 33 percent destroyed. Nonetheless, it was felt that limited production might still be possible. Therefore 128 B-29's went back to Kawasaki on the night of 1/2 August. Twenty-two of the 121 aircraft which bombed the primary were damaged, but none of them were lost. Photographs taken after this assault showed one of the two refineries destroyed for all practical purposes, and the other 40 percent destroyed.

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The remainder of the area was damaged, and 42 percent of the storage capacity was damaged. The Kawasaki Refinery had ceased to be a factor in the war. ⁷62

The next installation to receive the attention of the 315th Wing was the Ube Coal Liquefaction Company plant. Synthetic fuel and lubricants were increasingly important to Japan with the loss of East Indies oil. Eighty aircraft, of which 74 bombed, took off for a mission aimed at this installation the night of 22/23 July. This first assault did serious but scattered damage to the plant. The second raid, by 108 planes the night of 5/6 August, resulted in nothing less than 100 percent destruction of the refining units. As an extra added attraction, the adjacent Ube Iron Works was 50 percent destroyed. ⁷63

On 19/20 July and 9/10 August the wing aimed its bombs at the Nippon Oil Company Refinery at Osaka. The first mission did serious damage to the operating units and in the synthetic refining area and destroyed 39 percent of the storage capacity. After the strike of 9/10 August "Photo reconnaissance . . . disclosed that the target had ceased to exist." No planes were lost on these two missions, and minor damage was inflicted upon only four. ⁷64

The skill which the 315th Wing had gained with experience was demonstrated in its attacks upon its two remaining targets. The Shimotsu Oil Refinery felt the explosive power of 1,404 x 500-¹⁵ GP bombs on the night of 28/29 July. Reconnaissance revealed soon afterward that the plant had



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been almost completely demolished by this one raid. Seventy-five percent of the storage capacity was made useless, and all of the refining units suffered heavy damage. On the last night of the war the 315th Wing flew the longest non-stop combat mission ever flown up to that time -- 3,740 statute miles to the Nippon Oil Company Refinery at Tsuchizaka, on the far northwest coast of Honshu. Although the distance flown reduced the bomb load which the B-29's could carry, the refinery was "Almost completely destroyed or damaged."⁶⁵

In a booklet made up of mission reports and before and after photographs of its targets, the 315th Wing stated proudly but rather accurately: "In the short time of its operation the 315th Wing revolutionized heavy bombardment by proving that it is possible to knock out small difficult targets through the use of APQ-7 radar." In 15 missions the wing had ~~knocked out~~ the major oil industries of Japan. Nine refineries had been rendered inoperative, and 6,055,000 barrels of storage capacity had been destroyed, all by radar bombing at night. The wing had mounted only 1,225 sorties of which 1,114 had bombed the primary targets. Only ~~three~~ planes were lost, and only 66 suffered damage. Crew casualties for these missions amounted to only 30 men. It is highly improbable that aerial warfare had ever before brought about such imposing results at so little cost.⁶⁶

Summary. The B-29 offensive against Japan was, after the correct tactics had been decided upon, most impressive in its accomplishments. In all, some 33,047 sorties were flown, and 159,862 tons of bombs were dropped.

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Sortie and bomb load figures are nearly meaningless unless the effects upon the targets are known, but in this case the effects were as impressive as the tremendous bomb loads.

The Fire Blitz, in its two phases, reduced 180 square miles of Japanese urban areas to ashes. No less than 602 major industrial plants were destroyed or damaged; much of this destruction resulted from night attacks, incendiary or precision. Mines had sunk almost a half million tons of Japanese shipping and presumably had damaged as much more. Only 485 B-29's had been lost, and the total personnel killed or missing came to 3,041. Bomber losses were only 1,38 percent of sorties, and crew casualties, including 332 wounded, were only 1 percent of exposures. Some of the missing crewmen, of course, were recovered from Japanese prison camps.⁶⁷

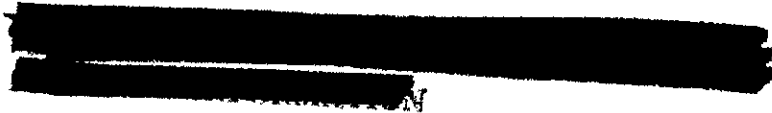
The effects upon Japan were disastrous. Aside from the two atomic bomb explosions, 269,187 people were killed by air attacks, 109,871 were seriously injured, and 195,519 were lightly injured. No less than 2,455,598 buildings were completely burned; 30,124 buildings were partly burned. Explosive bombs demolished another 54,915 buildings, and 63,810 were damaged by this medium. Naturally, this destruction of life and property had an effect upon production. Production hours lost from all causes rose from 20 percent in 1944 to 40 percent in July 1945. The productive capacity of key industries was reduced by the following percentages: oil, 83 percent; aircraft engines, 75 percent; air frames, 60 percent; army ordnance, 30 percent; naval construction, 28 percent; light metals, 35 percent; steel ingots, 15 percent;

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chemicals, 10 ⁷ percent. Nor was production reduced only in those factories damaged by bombs. The burning out of residential areas and the chain reaction which followed the destruction of one or more plants in a complex reduced production in factories which had been untroubled by bombs. A sample check of plants in 39 cities revealed that by July 1945 production in damaged plants was down to 27 ⁷ percent of peak ^F production on the average. At the same time, however, production in undamaged plants was only 54 ⁷ percent of its peak. ⁶⁸

In conclusion, while they were bombing a weaker national industry, the Superfortresses had accomplished over Japan in ¹⁰ ~~ten~~ months what B-17's and B-24's, plus the RAF Bomber Command, had not completely accomplished over Germany in ³ ~~three~~ years. The theory of high-altitude visual precision bombing was tried and found wanting. The practicability of night city burning, at least for Oriental cities, was wholly proved. It was demonstrated that long-range bombers could play havoc with a maritime nation's shipping by well-placed mines laid at night. Lastly, the 315th Wing showed that night radar bombing, with the correct instruments, could be as precise and destructive as visual bombing by day.





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VI. NIGHT COMBAT OPERATIONS IN THE KOREAN CONFLICT

The period between wars. The following statement was made in the first year of the Korean conflict: "Inability to operate effectively at night was one of the outstanding weaknesses of the Air Force during World War II and very little has been done since then to overcome this deficiency."¹ There can be little doubt that, in general, this statement was correct. On the other hand, some scattered attention was given to the problems of night operations during the years 1945-¹¹50. A review of some of these developments is in order here.

The P-61 had not been an entirely satisfactory night fighter during World War II, but night fighter units ~~---~~⁻⁻⁻ or all-weather fighter units, as they were later to be designated ~~---~~⁻⁻⁻ remained equipped with this outmoded airplane until 1950 in some cases. It had been realized at the end of the war that jet-powered night and poor-weather interceptors were needed, and two AI-equipped jets, the F-89 and the F-94, were under development during the latter half of the ~~decade of the~~ 1940's. It was also felt that an interim propeller-driven plane was needed to replace the P-61 before jets became available.

In January 1944 the ~~Air Force~~^{AAF} had contracted with North American for production of the F-82. This plane, which looked like two F-51's welded together, was to become the interim all-weather interceptor. Tests of a two-place radar-equipped P-38 intended for use as a night fighter were made in October 1945, but the F-82 was preferred. The F-82 was not a night





fighter pilot's ideal, however. Its field of ~~view~~^{vision} was limited; the pilot's view of the instrument panel was obstructed; and the airplane had poor landing characteristics. Moreover, the night vision of the crew was ~~adversely affected~~^{adversely} by exhaust flame, instrument glare, and the flash from the six .50-caliber muzzles. Also, when the guns were fired, the plane assumed a nose-down attitude and had to be retrimmed.²

~~Actual~~ night fighter organizations seem to have been in a state of sad confusion during the period of peace. Rapid demobilization first brought chaos; then as some semblance of operational status was being restored, economy policies brought confusion worse confounded. In the case of some units, whole months passed when no night flying at all was accomplished, and other squadrons failed to log as much as 100 hours flying time either day or night. The 417th Night Fighter Squadron, for example, logged half of its flying time for December 1945 in L-5's. This unit was on occupation duty in Germany, but its ground training program "consisted of two hours of orientation and one hour of close order drill being given each week." Similar observations might be made regarding other night fighter organizations.³

(~~the~~ Air Force) effort during the few years of peace was ~~concentrated upon its~~^{concentrated on} strategic air arm, which was expected to strike the decisive blow in case of war. Since strategic attacks were expected to be delivered at great distance and therefore beyond fighter escort range, Strategic Air Command crews were trained in radar bombing techniques. Moreover, new and more accurate radar bombing methods were developed, and older ones were refined.



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"Formation flying, night and daylight simulated bombing missions, and radar bombing equipment improvements had been factors in rounding out SAC unit versatility. The radar bombing training would be of value in . . . Korea."⁴

In the field of tactical bombing and intrusion, an important experimental project was carried out in 1947 and 1948 by the 47th Bombardment Group. This unit had flown as an intruder force during World War II, using A-20's and A-26's. It was still equipped with the latter plane at the time the study under discussion was made. The conclusions reached as a result of this project were to be borne out almost to the letter in Korea.

In regard to visual bombing of unlighted targets on dark nights, it was stated that worth-while results could be had only with the best crews and an exceptionally well defined IP and target. Such bombing was justified only as a last-resort measure. Visual bombing could be accomplished with more likelihood of success if the moon or stars afforded light.

¹⁰⁰² Under moonlight conditions the best approach to land targets was out of the moon. The moon had to be at least 45° above the horizon to be a great deal of help, however. In the case of water targets the best approach was into the moon, in order that the target vessel might be silhouetted. If horizontal bombing was to be carried out, an altitude of 1,000 to 4,000 feet gave the greatest accuracy; a fixed-angle bombsight was preferred over the Norden. Skip bombing from 200 to 500 feet was more accurate than level bombing by night as well as by day.

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In darkness bombing accuracy was greatly increased by the use of flares. On the practice bombing range the 47th Group found that the best results were obtained by setting the flare to ignite at 2,000 feet and releasing bombs some one to two minutes later. The best aiming point, however, was a suitable target marker on the ground. The T-18 marker bomb, with a burning time of ¹²thirteen minutes, was satisfactory for unobscured targets, but something better was needed for a built-up area or a target obscured by smoke. The ideal procedure, apparently, was for one pathfinder plane to illuminate the target with flares, another to drop a marker bomb on the target, and the remainder to aim at the marker bomb. The report noted that the AN-M-26 flare was unreliable since it gave satisfactory performance only half of the time.

Insofar as electronic bombing devices were concerned, the 47th Group found that conventional AN/APQ-13 radar was not accurate enough for tactical targets, but it was an excellent navigation aid. AN/APQ-5B (LAB) radar was an excellent device for use against ships, but was of limited value ~~for~~ ~~use~~ against land targets. Shoran was eminently satisfactory for stationary targets within 200 miles of the Shoran stations, and this device had added worth in that an airplane equipped with Shoran could drop a marker bomb which could be used as an aiming point by any number of succeeding bombers. Apparently there was no evaluation of SCR-584 (or MPQ-2) radar bombing. The report also noted that no combination of visual and radar bombing could be recommended.



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Up to 250 miles, ^fShoran was the most reliable method of night navigation. If flying was to be done at low altitudes, ^{the} SCR-718 absolute altimeter was a necessity. For extensive overwater flying, AN/APQ-9 was the best electronic aid. AN/APQ-13 radar, when used alone, was dependable only when the flight was over broken coast line. As for conventional navigation methods, celestial fixes were not useful to light bomber navigators. A combination of DR, pilotage, and AN/APQ-13 gave best results under normal flying conditions. Needless to say, the ^{light} illumination provided for navigation instruments ~~could not be of any type which would interfere with night vision.~~

The project report contained a careful analysis of night strafing. While the conclusion was reached that such attacks were feasible with experienced crews, it was pointed out that strafing at night was very different from the same operation as carried out in daylight. Because sighting was so difficult, pilots tended to fire too long bursts. Also, since the range of vision was so much shorter than in daytime, pilots had a tendency to press their attacks too closely. Because of this last-mentioned tendency, it was judged ~~to be~~ essential that the co-pilot concentrate upon the instruments during a strafing attack so that he might take over the airplane in case the pilot became blinded or flew too close to the ground. It was the duty of the bombardier-navigator to watch out for terrain hazards. Even when the moon gave some light, the pullout from a strafing run had to be made above 200 feet. The report suggested that tracer ammunition might be eliminated from the attacking plane's armament.

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Even when artificial illumination was used, it was discovered that night strafing differed materially from low-level day attacks. For a strafing run at night under illumination, a string of flares at 3,000 feet and a half-mile apart was needed. Best results were obtained when, at the instant of the strafing run, the flares were 1,000 yards from the target and parallel to the axis of attack. ~~For this state of affairs to exist,~~ of course, the flares had to be dropped upwind from the target. A single plane could illuminate its own target by turning ^{30 or 45°} upwind for 15 to 30 seconds on the approach, returning to the original course, and then releasing the flares. The strafing run could be made on a reciprocal heading in relation to the original approach.

Better results were obtained when one bomber dropped flares in order to provide illumination for another strafing plane. When the target to be attacked was stationary, a marker bomb, preferably red, made a good aiming point. Two or more such marker bombs were better, because they then tended to illuminate surrounding terrain features.

Rockets could be used for night attacks, but they were definitely hazardous, because they had a five-second blinding effect upon the pilot of the plane making the attack. The most accurate results were obtained by aiming the rockets from a shallow dive at about 1,500 feet true altitude. It was suggested that rockets might be aimed by means of the AN/APQ-5 bombing computer with an average horizontal error of 50 feet and an average range error of 100 feet. It was believed that this error would not be nearly so great for experienced crews.

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Visual strafing under conditions of near-complete darkness was said to be suitable only for area targets. Even for such a target, it was inadvisable for the attacking plane to dive at an angle of more than 10° and it was recommended that the pullout be made at least 300 feet above the ground. Such an attack, with machine guns, was feasible only when there was an unmistakable check point within five miles of the target. Visual rocket attacks at night were simply not advisable. If the target to be hit was small, moonlight with the moon at least 45° above the horizon was essential. When the moon was full and bright, night strafing approached daylight accuracy.

The project report made a number of recommendations. One was for the development of a simple open wire bombsight with visible crosshairs illuminated by red light. Better target marker munitions were suggested, and especially, was a better flare required for night bombing. Needed was a flare of 1,000,000-candlepower, which would burn for five minutes; the M-26 burned, if at all, for 3 1/2 minutes with 800,000 candlepower. For strafing, it was recommended that experiments be directed toward the development of an infra-red or radar gunsight. Improvement and extension of the range of Skoran could be expected to improve night bombing and navigation.

In the field of tactics and techniques, the project report proposed that more consideration be given to the capabilities of night tactical bombing by means of radar. Secondly, it repeated a recommendation made during World War II and later supported by Korean experience. This was simply that night tactical units should fly their training missions at night.⁵ While the

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advisability of such a procedure might seem obvious, it was often not followed.

The 47th Group, equipped with A-26 (now, B-26) light bombers, was officially designated a night attack group for several years after World War II. This mission ended, however, when the unit was reequipped with jet B-45 light bombers. "At the beginning of the Korean War the Air Force did not have a single unit trained for night intruder operations nor did it have an aircraft entirely suitable for this type of work." For night bombing, the air arm was somewhat better prepared; Strategic Air Command medium bomber units were trained in radar bombing methods. Night fighter preparedness was not outstanding, though it was impressive in comparison with the situation which had existed at the outbreak of World War II. As it turned out, night fighters, or all-weather fighters, were hardly needed during the first two years of the war in Korea.⁶

Night fighters in Korea. When the war in Korea broke out, the 68th Fighter (AW) Squadron was rushed into action to escort transports engaged in ferrying between Japan and Korea. The 68th, which had been created out of the 421st Night Fighter Squadron, was newly equipped with F-82's. One of these aircraft, operating by daylight, scored the first air victory of the Korean War. This early glory was soon to be obscured by disgrace. In September a 68th Squadron pilot bombed out a badly needed bridge behind United Nations lines, ~~during the morning.~~ ^{L 10 11} ~~During the afternoon of the same~~ day, the squadron commander made three strafing runs on Taegu, which was at the moment Fifth Air Force's Korean headquarters. As a result, the

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unit was taken off combat duty and put on training status for ¹²twelve days.⁷

After the F-82 had proved to be a poor intruder plane, the efforts of the 68th Squadron were devoted almost entirely to weather reconnaissance during the latter part of 1950. In Japan a strip alert was maintained. In carrying out its weather reconnaissance duties, the squadron received aid from a detachment of the 4th Fighter (AW) Squadron in December, 1950. The primary mission of this latter unit was the protection of American air bases on Okinawa.⁸

Since the Communists, through mid-1952, made no major night attacks upon United Nations forces in Korea, night fighter units had little to do. Weather reconnaissance and an occasional intruder mission relieved the tedium of strip alerts somewhat until late 1951. Thereafter, the growing Communist ability to mount a night bombing attack necessitated the withdrawal of all night fighters from intruder duty and their assignment to the single duty of air defense. Two AI-equipped jet-powered F-94's were assigned to the Fifth Air Force in December 1951. The value of the new planes was lessened, however, by the fact that they could not be used over MIG Alley or other enemy-held areas where the jet night fighters were "unusually susceptible to loss."⁹

The fact that night fighters found little to do should not lead to the conclusion that Communist airplanes failed to attack United Nations lines. On the contrary, United Nations airfields were bombed frequently during the early months of the war. In February 1951 the front lines were bombed no



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less than 13 times. On one occasion, the attacking plane took advantage of illumination provided for an American B-26. The planes making these raids, however, were PO-2's, liason-type single-engined biplanes which carried a very light bomb load and did negligible damage. Being very slow and highly maneuverable, these "bombers" were almost safe from interception by high-speed night fighters. Indeed, in February 1952, an F-94 was credited lost to enemy aircraft when it overshot its AI contact twice and then tried another run with flaps and landing gear down. GCI radar contact was lost soon after this run began, and when a flash was observed at 2,000 feet, it was assumed that the interceptor and its quarry had collided.¹⁰

Thus, although light attacks had been made, no serious bombing of United Nations positions had taken place by mid-1952. Had such bombing taken place prior to the arrival of F-94's in Korea, they might have proved embarrassing because the Soviet Union had received some 500 Mark III IFF sets as lend-lease during World War II. Since F-94's were equipped with Mark X IFF, the possession of these planes put the Fifth Air Force in a much better position to turn back or destroy attacking bombers. By June 1952 Far East Air Forces had 100 F-94's on hand, of which 24 were already assigned to combat units.¹¹ It is quite possible that the Communists might still have mounted damaging night bombing attacks in June 1952, but the venture would have proved more costly than if it had been carried out a year previously.

Night bombing in the Korean War. Although Korea saw the introduction

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of new jet-propelled fighter and fighter-bomber aircraft, horizontal bombing remained, through June 1952, the task of B-29's and B-26's of World War II vintage. Perilously slow by 1951 standards, the B-29 proved unable to defend itself from jet fighter attack by daylight; nor, seemingly, could jet fighter escort prevent successful passes at the bombers. As a result, the B-29 became a night bomber for all practical purposes before the end of 1951. B-26's, although used mainly as intruders, also bombed by night. One development of the Korean conflict was close-support bombing during the hours of darkness, but that phase of the air war deserves to be discussed separately.

During the first months of the Korean War, B-29's bombed by day. The few strategic targets in North Korea were quickly destroyed -- except power installations which were immune to attack. The medium bombers also engaged in tactical assaults on bridges, but it was not until January of 1951 that any significant part of the B-29 effort, except leaflet dropping, was carried out at night. Negligible air opposition was encountered during these first months, but over some targets antiaircraft guns were already a serious hazard. Fourteen planes out of 48 were damaged in one strike at the marshaling yards and arsenal and Pyongyang.¹²


On the night of 24 September 1950 an experimental bombing mission was flown by B-29's, and the technique of illuminating the target with flares was used. "This procedure was quite satisfactory for fixed targets . . . [but] the crew . . . felt that, although they were able to bomb quite accurately, they did nothing that could not have been performed better during daylight."¹³

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It was the 3rd Bombardment Group, whose B-26's were mainly occupied with intrusion, which initiated night bombing in November 1950. Night attacks were begun "for the purpose of disrupting enemy night attacks, interdicting the movement of troops behind the battle area and for general harassment of enemy reserves and supply installations which lay beyond the range of corps artillery."¹⁴

Medium bombers began night ~~working~~ operations in January 1951. "The plan, in general, was to employ five to eight aircraft per night in dropping . . . bombs on important communications centers, such as Pyongyang and Hamhung." A mixed load of instantaneous and delay-fused bombs was dropped so as to tie up these centers for as long a time as possible. Five such missions, 33 sorties in all, were flown in January. Pyongyang was attacked three times, Hamhung and Wonsan once each, with five to eight planes over the target on each of the missions. Bombing was by radar, and the B-29's bombed at intervals of twenty minutes to ~~one hour~~. According to the 98th Bombardment Group, "This type mission proved very effective, not only from an operational standpoint but also from a training standpoint, as it afforded excellent opportunity for maintaining the efficiency of the radar operators." Radar was not needed in all cases, however. "On bright moonlight nights, reflections from large rivers and the snow covered ground enabled the bombardier to obtain excellent results visually." While no evaluation of the physical destruction accomplished by these missions or of their effect upon transportation is possible, it is perhaps significant that



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under questioning a group of North Korean civilians professed greater fear of night than day bombing.¹⁵

Except for a slight interruption during the latter part of January, these night harassing attacks continued through the winter and spring of 1951. Sixteen missions involving 50 B-29 sorties were flown in February, and eight communications centers felt the weight of some 2,000 variable fused 500-lb. bombs. Pyongyang, victim of ¹³six missions and 16 sorties, received most attention. Six fighter passes were made at the bombers over this city, but no damage resulted. Intelligence reports during February indicated that night harassment had ". . . proven very effective in disrupting the enemy's supply schedule. Troop and supply movements through the towns selected for attack have come to a virtual standstill during the hours of darkness."¹⁶

While Communists may have been seriously hampered in their supply movements by these early attacks, they soon learned to surmount such difficulties. Three B-29's were scheduled for such missions each night after a command conference which took place 21 March 1951. The success of some missions was evident: on the night of 15 March three B-29's loaded with incendiaries made six runs on the supply center of Haeju, and "numerous fires and several large explosions" were observed. On the other hand, when the entire B-29 normal effort on the nights of 4, 5, and 9 April was directed against such targets "with the intention of disrupting vehicular traffic and immobilizing convoys in order that they might be attacked by fighters and light bombers the next day," only limited success was attained and such attacks were not repeated on such a large scale.¹⁷

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While radar bombing of communications centers was bringing doubtful results, a new type of blind bombing, so far as the Korean campaign was concerned, was getting underway in the spring of 1951. Shoran was not new to the Air Force; before the close of World War II it had been used for bombing through Italian clouds, and it had proved rather successful. Peacetime experiments, as noted above, had again demonstrated Shoran's accuracy. If oversimplification be permitted, Shoran may be described as a navigation device by means of which an airplane with the requisite equipment could accurately pinpoint its position in relation to ground radar stations. By the use of special Shoran charts, a bomber equipped with the necessary receiving devices could attack any target within Shoran range for which data had been precomputed, with accuracy near that of visual daylight bombing.

A Shoran beacon unit had attempted operations in Korea during the confused fighting of late 1950. It had proved ineffective. This was to be expected, because frequent movement created almost unsurmountable difficulties in maintaining the bulky but delicate ground stations. Also, the computations which had to be made before operations could be carried out depended upon the position of the ground stations. When it was necessary for the location of the beacons to be changed frequently as the war flowed up and down the Korean Peninsula, there was little possibility of the successful application of Shoran techniques. During the last days of December 1950, a reorganization of the beacon unit was begun, and this reorganization was to bring a significant increase in the effectiveness of night bombing.¹⁸

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The 3rd and 452nd Bombardment Groups initiated Korean experiments with Shoran in early 1951. These early practice missions were flown by day, but the bombing techniques used were the same as those later to be applied at night. The results of the training missions were promising. It was reported that on one four-plane mission against a railroad bridge the 28 bombs dropped by the B-26's caused heavy damage and showed an average circular error of only 80 feet. During March the light bombers began night Shoran attacks upon airfields, communications centers and supply centers 60 to 100 miles behind the enemy's front line. Crews still lacked sufficient training in Shoran techniques. The 3rd Group reported in May 1951 that Shoran required "more coordination, air and ground, than was available most of the time." In May, however, the 452nd Group received 16 Shoran-equipped aircraft which were quickly put to use. B-26 attacks on three highway bridges, bombed over a six-week period on a practice basis with one bomb dropped at a time, showed a circular error of 412 feet.¹⁹

The possibility of accurate Shoran bombing by light bombers having been demonstrated, the 452nd Group was removed from day operations in June; this unit then joined the 3rd Group as a night attack organization. During June the 452nd's night effort was concentrated upon night close support "and on Shoran bombing of airfields, troop concentrations, supply centers, etc. . . . By 20 June the 452nd had been converted to complete night operations and all B-26's of the Fifth Air Force were to be so used until more lucrative day targets became available."²⁰

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It should be understood that by far the greater part of B-26 effort was directed at night intrusion. Shoran sorties were flown, however, when good targets were available, or when weather prevented intruder flights. In July 1951 the 3rd Group discovered a "new" tactic advocated by the old 47th Group three years earlier. A pathfinder B-26 dropped a 500-~~lb~~^{lb} incendiary bomb by Shoran to serve as a marker for the remaining planes on the mission. This tactic was especially useful, of course, when some planes of the unit were not equipped with Shoran. Some highly successful B-26 Shoran strikes were delivered during October 1951. Before dawn on 9 October the light bombers "fired a mile square enemy storage area near Ongjin. Many blazes and secondary explosions indicated heavy destruction of ammunition and fuel." That night the B-26's "took a heavy toll of vehicles . . . [and] exploded an ammunition dump in central Korea." Another dump near Ongjin was destroyed the night of 10 August. B-26 Shoran attacks continued through the remainder of 1951 and the first six months of 1952. They were mounted, usually when weather prevented intrusion. During the spring of 1952, however, there was an increasing tendency to send the light bombers to Shoran targets during the period of full moon because intruder sorties were less productive under such conditions.²¹

In the meantime, medium bombers had begun Shoran operations. Equipment was installed in several aircraft of the 19th, 98th, and 307th Bombardment Groups in the spring of 1951. By June the 98th Group reported attaining a circular error of 430 feet on training missions, and a daylight attack upon



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an airfield south of Sariwon ~~28 June~~ knocked out a runway. All results were not good, however. B-29's which struck Hwangju Airfield ~~the 29th of June~~ missed their target no less than seven miles. Intensive Shoran training continued during July, when 118 such sorties were sent out. Skill was gained as these training flights continued; this was demonstrated 26 July when a formation attack on the Pyongyang Marshalling Yards, with the lead plane aiming by Shoran, resulted in a circular error of only 108 feet.²²

These early Shoran bombing missions were flown by day. The only difference to be anticipated between night and day bombing, however, was that formations would be impossible at night. Good results could nonetheless be expected from individual runs. In August, when weather forced cancellation of daylight attacks "a maximum number of Shoran equipped aircraft were dispatched on night Shoran missions against one primary target, which procedure increased greatly the percentage of effective attacks against primary targets as well as providing valuable Shoran training."²³

Beginning the night of 26 August 1951 harassing attacks by means of Shoran were scheduled. "The plan was to assign an individual aircraft fully loaded with bombs to one or two key . . . marshalling yards." It was expected that this program would not only result in harassment of the enemy, but also, because of the accuracy obtainable with Shoran, have "the more effective result of interrupting rail traffic." In some ways this was thought to hold more promise than day bombing of rail targets because "Repair of the rail lines takes a longer time at night, when more trains have been moved at night

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than during daylight hours." Insofar as hitting the target was concerned, this program was successful. "All indicated results thus far reveal that night Shoran attacks are just as accurate as daylight strikes."²⁴

By late August Shoran computations were complete for 83 airfields, supply centers, and marshalling yards. Important bridges were soon added to the list of targets, and on 23 September a 19th Bombardment Group formation, bombing through clouds by Shoran, knocked out the center span of the vital Sunchon by-pass railroad bridge. This mission --- "an excellent example of bombing that can be accomplished with thoroughly trained crews" --- was flown by day, but it was a herald of successful night missions to come. Another example of what could be done with Shoran came on the night of 22 October:²⁵

Rapid planning and execution of a Shoran mission was demonstrated on the night of 22 October 1951 when two aircraft from the 98th Bombardment Group hit two pinpoint targets in Pyongyang. The targets, two areas in which high-level Communist meetings were to be held, were reported on the morning of the 22nd. During the day computations were obtained, crews were briefed, and bombs loaded. The targets were attacked at 2100I and 210II that night. Photography reveals that the targets were hit, and, while it may be but a coincidence, on the morning of the 23rd of October there was a change of delegates to the truce talks.

It was well that an accurate method of night bombing had been developed. The quick destruction of the North Korean Air Force in the first weeks of the war had given the B-29's free range over the Korean skies; antiaircraft guns afforded the only resistance encountered. The entry of the Chinese into the war brought an end to this happy state of affairs; Russian-built MIG-15 jet fighters began to wing their way across the Yalu River. Early in 1951 Red

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fighters ~~began to appear~~ so frequently in the northwestern part of Korea that interdiction attacks in that area were turned over to Fifth Air Force fighter-bombers; B-29's were given interdiction targets in areas where fighters were not so frequently encountered and went into northwest Korea only to strike more important objectives. ~~Airfields were among these important targets, and the bomb-carrying capacity of the medium-bombers was needed to neutralize them.~~ As a result, B-29's were on occasion subject to MIG attacks. When clashes came, the lumbering and practically obsolete Superfortresses proved almost helpless. American jet escort was provided for missions into MIG Alley, as northwestern Korea came to be called, but in October this proved to be of little avail against determined jet interception.

Six days time served to demonstrate this fact. Between 21 and 27 Octo-
ber MIG's shot down five B-29's, three F-86's, and one F-84; eight B-29's, one F-86, and one Australian Mark 8 were damaged. The Communists lost 12 MIG's in these battles, but the Far East Air Forces Bomber Command could not bear such B-29 losses. ~~As a result~~ a commanders' conference ~~was held at Itazuke Air Force Base,~~ and "it was decided to employ no more B-29 formations on daylight missions . . . until more important targets developed or until other significant changes in the situation occurred." Bomber Command believed that this change was dictated by the fact that friendly fighters were needed for other than escort duties, while the official history of Far East Air Forces states that the B-29's were "temporarily devoted

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to night Shoran operations when attacking targets located in sensitive MIG areas." The temporary diversion, if such it was, continued for almost a year. It was not until September 1952 that B-29's again ventured over North Korea in daylight. It is significant that when American jets shot down a number of MIG-escorted TU-2 light bombers on 30 November 1951, Far East Air Forces intelligence reported that this event might "bear out^r the experience of friendly bombing missions to the Yalu area when it was determined that it is extremely difficult for a jet fighter escort to prevent enemy jet fighters from reaching the bomber formation."²⁶

From 28 October 1951 until late summer 1952, all B-29 combat operations were at night. During November and December 1951, the main effort was directed against Communist airfields south of the Yalu River. Ten Shoran receivers were removed from B-26's and installed in B-29's until the arrival of new sets from the United States made further transfers unnecessary. An intensive training program was continued in order that all crews might develop Shoran proficiency. Practice missions against targets near the front lines resulted in a number of direct hits and very few gross errors.²⁷

Steady improvement in Shoran bombing made it possible for Bomber Command "to perform effective night missions and avoid encountering increased fighter opposition." During November no B-29's were lost to enemy aircraft, and only one succumbed to ground fire. None were lost during December, and only four were damaged despite the fact that heavy

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antiaircraft fire was encountered. Antiaircraft accuracy was reduced by the use of chaff and, to some extent, radar jamming. ^{ECM} Difficulty was met with in using the latter, because for some unknown reason it interfered with Shoran reception. Sometimes, in order to surmount this difficulty, a special ECM ship was sent along on missions to heavily defended targets. ²⁸

The night attacks upon North Korean airfields succeeded in denying their use to the Communists on any significant scale. The fields at Namsi, Taechon, Saamcham, and Uiju were attacked most heavily and were definitely rendered unserviceable. Namsi was bombed on seven successive nights. For these missions the bombers carried either 100-~~lb.~~ or 500-~~lb.~~ ^{general purpose} bombs. Generally 100-pounders were preferred because, although they made smaller craters, they made many more of them. On occasion, when planes were believed to be parked on the target airfield, one or more of the attacking bombers carried 500-~~lb.~~ ^{proximity-fused} bombs. Air bursts had the double virtue of destroying airplanes parked in revetments as well as inhibiting antiaircraft fire. ²⁹

So successful were the B-29 attacks upon airfields that during December part of the medium bomber effort was diverted to attacks upon bridges and marshalling yards as an aid to the Fifth Air Force in its interdiction program. On 20 December, with only two serviceable airfields, Sinuiju and Uiju, remaining available to the Reds in North Korea, Bomber Command directed that normal effort against these targets would consist of two B-29's per night. This left many medium bombers free for interdiction targets. ³⁰

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Bridge attacks using Shoran proved surprisingly successful. During December "slightly over 50% of the attacks" resulted in "major damage to the rail bridges." However, the bombers were in no danger of running out of targets, because "The enemy . . . continued to repair these crossings at a phenomenal rate which necessitated repeated attacks." The Shoran attacks against rail bridges continued through the first half of 1952. The normal effort was for two planes to attack airfields, three to render close support, and the remainder available to bomb transportation targets. During one week in January, Far East Air Forces intelligence reported at least five bridges knocked out by B-29's aiming by means of Shoran, and there were others for which damage-assessment photographs were not available. Although this bridge-wrecking program was effective, it is interesting to note that 200 or more 500-lb. general purpose bombs were needed for each bridge destroyed. ³¹

While the greater part of the medium bomber effort was directed against airfields, communications, and close-support targets, supply centers, dumps, and military installations were bombed from time to time. The intensification of air blows at the Communists which began in mid-1952 afforded the B-29's new targets. It was intended, in fact, to follow up the first blow of this campaign, a daylight fighter-bomber strike against the Suiho hydroelectric plants, with a full-scale B-29 assault on the same targets by night. Since the fighter-bombers destroyed the target, the 25 scheduled medium bombers flew front-line close support the night of 24 June. ³²

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Shoran had proved to be the answer to night bombing of targets within a few hundred miles of the front lines. It is interesting to note that not only was Shoran practically as accurate as visual bombing, but that once a bomber was committed to a Shoran run, better results could be obtained by continuing it than by switching to visual sighting in case the target was seen. "When a bomb run is committed to Shoran and the seventy degree sighting angle has been reached or the aircraft is closer than fifteen miles to the target, under no circumstances should the run be taken over visually." This statement was based upon experience. "On all previous tries bombs missed the target, and if the Shoran arc had been made good, there would have been an excellent possibility of destroying it."³³

Shoran had certain drawbacks. In the first place, instrument error increased greatly as the angle of incidence of the two arcs by which the airplane determined its position diverged from 90°. When the two arcs met at right angles, the position of the bomber was known within a 100-foot square. When the angle of incidence was 30° the possible position of the plane lay within a much elongated diamond-shaped area. Another objection to Shoran lay in the fact that the bombing plane had to track along one or another of the intersecting arcs. When other factors had to be taken into consideration, this often meant that only one approach could be made. Especially was this true when the targets to be bombed were near the Manchurian border. Moreover, no evasive action could be taken on the bomb run. Therefore, the defenders were often able to line up antiaircraft guns and searchlights along

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the track of the approaching bomber. Reports on Model II ~~Shoran~~, which was understood to permit a bomb run from any direction and which ~~permitted~~ evasive action on the run, were read eagerly, but this device had not appeared in Korea by mid-1952. ³⁴

One answer to searchlight concentrations was a tactic which dated back to Thirteenth Air Force attacks on Bougainville from Guadalcanal. It was first used in Korea on the night of 23 December 1951 when a B-26 strafed searchlights and antiaircraft batteries at Uiju during a Bomber Command attack. ³⁵

Night close support in Korea. If ~~Shoran~~ was the answer to night bombing of communications and other targets within a few hundred miles of the front lines, AN/MPQ-2 radar was the secret of successful night close-support operations. AN/MPQ-2 was the designation of an improved version of SCR/584 gun-laying radar. The original device had been successfully used for close-range night precision bombing on a limited scale in Italy and France before the end of World War II. The use of MPQ-2 was simple. The operator of the ground radar set selected the target to be bombed and computed the dropping angle from the bomber's known speed and altitude. This operator then served, for all practical purposes, as bombardier, talking the bomber over the target and giving the signal for bomb release. Some radar operators claimed accuracy within 30 yards by this method. The technique proved especially helpful in Korea, where the Communist enemy evinced a preference for night ground offensives.





Night close support was sadly lacking during the first three months of the Korean War. Some effort was directed toward correcting this deficiency in October and November 1950, though without any marked success. At first a lone B-26 dropped a flare, then attempted to strafe by its light. An improvement was made by having one B-26 serve as flare ship for several others; the remaining planes used the illumination provided by the flare ship to strafe targets designated by a Tactical Air Control Party on the ground. The Fifth Air Force reported that "This latter system proved to be extremely effective and also had a beneficial morale effect upon the friendly ground forces witnessing the attack."³⁷ It seems probable that this estimate of such attacks was overly optimistic.

In October a group of Communist prisoners was questioned regarding air attacks the men concerned had undergone. Almost 80 percent of these prisoners of war had been attacked from the air, but only 25 percent of them had experienced night attacks. Also, the lack of direct air support at night was a subject of disparaging comment by front-line United Nations troops at the same time. The 3rd Bombardment Group's experience with this type of attack led it to the conclusion that night close support could be successful only when some easily discernible line of demarcation, such as a river, lay between the opposing armies. An evaluation of the first phase of the Korean War stated flatly: "Our night operations against enemy troops could not, by the wildest stretch of the imagination, be credited with any success other than harassing the enemy."³⁸





When front-line close support by means of artificial illumination bade fair to prove disappointing, Far East Air Forces suggested to Bomber Command that B-29's be used "at night to conduct attacks along the battle line using airborne radar . . . but that . . . was definitely beyond the capability of the APQ-13 radar with which the B-29 is equipped." Bomber Command did run a test project, however, utilizing a stationary ground radar beacon to mark the theoretical front line. "Preliminary results as of the end of January indicated a lack of reliability and a probable error of several miles in determining the exact location of the front lines."³⁹ Needless to say, close-support bombing could not be undertaken with any such probable error in prospect.

As indicated above, the introduction of MPQ-2 sorties solved this night close-support problem. The method's simplicity was one of the factors in its favor. The only airborne equipment necessary was a radio with which to receive the ground operator's instructions. Any plane with a bomb load could report in to ground control and be directed to a front-line target when weather prevented deeper penetration into North Korea. The effectiveness

of these sorties was increased by the availability of proximity fuzes. Usually the planes were loaded with 500-lb. general purpose bombs with these fuzes.

When the bombs exploded a few feet above the ground, they had a much more devastating effect upon personnel than if allowed to penetrate the ground.⁴⁰

MPQ-2 missions began in March 1951, and Bomber Command B-29's flew 27 such sorties before the end of the month. The 98th Group reported: "It appears that this system is the most successful yet used for direct front-



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line or close support of ground troops. Representatives of the ground forces visiting this organization are outspoken in their enthusiasm over results. "The 37d Group stated that 300 high-ranking officers of the Chinese army had been killed in March during MPQ-2 attacks on Seoul, and in April two B-26's were credited with killing 400 Chinese in one night."⁴¹

It was during the Chinese offensive of April and May 1951 that night close support achieved its best results. In order to attack, the enemy was forced to assemble in the open, and thus was especially vulnerable to the air bursts of the 500-pounders. On the night of 15 April, in the X Corps area, B-26's under MPQ-2 direction bombed the Chinese buildup; they were followed by C-47's which strung flares across a rectangular area marked by artillery star shells. By the light of the flares Marine Corsairs swept in to strafe. "Prisoners surrendering the next day complained that they could not fight all day and stand bombing and strafing all night."⁴²

The Communist offensive opened on 22 April, and on the night of ~~23 April~~^{23 April} five B-29's were sent out to support the United Nations defenders "against the tide of humanity pouring down from the north." B-29's were over the battle lines with the B-26's every night as the offensive continued. One Superfortress, on the night of 29 April, was credited with killing 600 Communist troops and stopping an attack before it could jump off. Throughout May the medium bombers were at least five strong over the front lines every night. The 19th Group devoted 25 percent of its effort to such targets, and the 98th Group exceeded this by five percent. On the night of 17 May "the

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heaviest night attack of the war" was unleashed. "The medium and light bombers ranged up and down the battle front, dropping proximity-fused 500 pound bombs upon enemy installations and troop concentrations." Then, in four nights, 19th 22 May, B-29's flew 85 close-support sorties. During this short period B-29's alone dropped some 3,400 quarter-ton bombs upon the attackers.⁴³

It seems apparent that the results of these missions were good. "One report stated that a large-scale enemy attack was completely disrupted by one aircraft dropping a full load of 500# bombs. . . . Another report listed 800 dead from one drop by one B-29." As a result of attacks on the night of 20 and 21 May, "The Ground Controller reported that . . . close support attacks alone had killed two regiments and one battalion of enemy troops. The number of dead was determined by actual count." A message sent to EUSAK (Eighth United States Army in Korea) regarding enemy reaction to bombing in support of the 2nd Infantry Division stated that "Disorganization and panic of units bombed at night made reorganization during hours of darkness impossible, with the result that no attack was received."⁴⁴

Throughout 1951 attempts were made to utilize an airborne AN/APN-60 radar beacon to increase the range of MPQ-2 bombing and to permit formation drops by ground control. By the middle of the year five aircraft in each of the medium bombardment units of FEAF were equipped with this device. Considerable difficulty, which Bomber Command blamed upon the ground stations, was encountered in using this equipment. Tests made in Japan had indicated

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that accurate bombing was possible by this method up to 175 miles from the control site, but in the rugged Korean terrain 60 miles was found to be the maximum range. Even within 60 miles of the control site, APN-60 missions were not so accurate as *Shoran*.⁴⁵

The front lines were relatively stable from mid-1951 through June 1952. ~~Because of this, MPQ-2 sorties were not so lucrative,~~ the best targets for this type of bombing were presented when the enemy was advancing or retreating. Late in July 1951, therefore, the number of B-29's assigned to close support nightly was reduced from five to two, and was cut to only one ~~sortie~~ in April 1952. It should be understood that these assigned sorties represented a minimum. When planes and targets were available, many more ~~sorties~~ ~~than this~~ might be sent out. B-26's joined the B-29's when weather prevented intruder sorties. During the daylight bombing phase of 1951, B-29's were diverted to night close support when weather reports indicated overcast ^t targets for the next day. If the planes had not been loaded by the time the decision was made, they were then bombed-up with 500 pounders with proximity fuses. If the bombs were already aboard, the front line *Tactical Air Direction Party* was instructed to select targets suited to the bomb load.⁴⁶

As a result of this policy, the number of MPQ-2 sorties flown by Bomber Command increased each month from August through November 1951. After November the proportion of close-support sorties was not so large, but more than the minimum number of B-29's was frequently over the front lines. On the nights of 21 and 22 June 1952 no less than 38 such sorties dropped bombs.

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At the same time numerous close-support sorties were flown by light bombers, either as a primary mission or to dispose of bombs left over from intrusion. The proportion of B-26 MPQ-2 sorties was increased in the spring of 1952 because intruder effort was reduced on nights when the moon was bright. During one week in mid-June no less than 134 B-26 close-support sorties were mounted.⁴⁷

It seems possible that the effective utilization of MPQ-2 bombing for night close support was one of the most important developments of the first two years of the war in Korea. The results obtained would seem to bear out the assertion that "The AN/MPQ-2 radar equipment, along with the use of the VT [variable time] fuse on the 500# GP bomb is an excellent weapon. Great possibilities still exist in development of tactics for this type bombing."⁴⁸

Night intruders in Korea. ~~As had been the case in World War II,~~ the Air Force quickly established superiority over the battlefield in Korea. Except for ineffective sneak attacks by light liaison-type aircraft, United Nations ground forces were safe from enemy bombing. Medium bombers quickly destroyed the few strategic targets available to them, and the weight of air attack, fighter, light bomber, and medium bomber, was quickly devoted to communications and troop movements. As a result, the North Koreans, ~~like the Germans and Japanese before them,~~ found it most difficult to use the roads and railroads for troop and supply movements by day. Having no other choice, they began moving trains, motor transport, and

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troops under cover of darkness. Thus, almost from the inception of the Korean War, there was need for an effective night intruder program.

Available for such use were F-51 single-engine fighters, F-82 twin-engine night fighters, F-80 jet fighters, B-26 light bombers, and B-29 medium bombers. The F-51 had ~~proved~~ a failure as an intruder during World War II, and the F-80 was soon shown to be unsatisfactory. Single-place jets "should not be employed for night interdiction inasmuch as the combined demands of navigation, orientation, observation, aircraft control and ordnance release, at low altitudes by night, when placed upon one individual, will jeopardize the effectiveness of fire power." The F-82 was more suited to intrusion than single-engine fighters, and was in fact so used, but it seems never to have been a wholly satisfactory airplane.⁴⁹ B-29's were designed for strategic bombardment and were almost completely unfit for intrusion duties. They too were used under the stress of events, but main reliance as an intruder plane was put upon the B-26.

The B-26, like the F-51 and the B-29, had seen service in the Second World War. Designated the A-26 at that time, it had been used successfully as an intruder in the Italian campaign by the 47th Bombardment Group. Moreover, it had been this plane with which the 47th Group had carried out its experimental project in night attack methods during the short period between wars. This is not to say that the B-26 was an ideal intruder. On the contrary it had many drawbacks. It could not operate in all weather, and it lacked navigation equipment needed for pinpoint intruder flying in rugged

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terrain. The plane was not suited for dive bombing and was equipped with the Norden bombsight, which was useless for low-altitude night work. The muzzle blast from the forward guns had a tendency to blind the pilot, and other armor and armament was not sufficient to enable the bomber to protect itself against interceptors. Of a less critical nature, but still annoying, was the lack of adequate room for the crew, and lack of oxygen, heating, and deicing systems.

Perhaps more serious than the faults of the airplane was the lack of skilled crews. Some members of the 3rd Group had had experience with the old 47th Group, but they must have been few in number. At any rate, the 13th Squadron of this group reported that "Of all the pilots, navigators, bombardiers, and gunners who flew the B-26 in combat during World War II and who were on active duty 25 June 1950, not one was assigned to the 13th Bombardment Squadron." Certainly the experience level was low, because it was stated in December 1950 that "The first five or ten missions for night intruder personnel are an almost complete loss as far as effectiveness is concerned."⁵⁰

Despite these impediments, an intruder program got underway soon after the outbreak of the Korean War. Eight B-26's were scheduled for night harassing attacks the night of 27/28 June, but were prevented by weather from carrying out their mission. As a result, the first night intruder sorties actually mounted were carried out by six F-82's on the night of 4 July 1950. B-26's flew their first night intruder sorties 9/10 July with



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six planes taking part. The intruder effort was not overwhelming at this stage; only 29 such sorties were flown during the month of July. This was far less than the light bomber effort devoted to day operations, and was little more than half the nightly intruder effort of late 1951.⁵¹

In carrying out these sorties, each B-26 looked for targets in an assigned area. Strafing was the usual method of attack. The Fifth Air Force tried during this early stage to keep at least one plane over the area back of the enemy lines at all times during the night so as to have continuous harassment. Despite poor technique and inexperienced crews, good results were obtained on these early missions. The main reason for success would seem to have been the fact that the enemy moved in closely spaced convoys with lights on.⁵²

In late July FEAF suggested that intruder sorties be stepped up to ~~fifty~~ per night, utilizing all available types of planes. This was plainly beyond Fifth Air Force's ability. As noted above, only B-26's and, to a lesser degree, F-82's could be used as intruders. Nonetheless, the number of sorties per night was considerably increased during August. Though the F-82's flew more by day than by night, they did fly a number of intruder sorties, concentrating upon convoys and river crossings. B-26's of the 3rd Bombardment Group bore most of the load. Though it was never possible to send out 50 sorties in one night, the Group did manage to send out 20 or more sorties on nine nights. During the whole month the B-26's were operational 29 nights and flew a total of 465 sorties. Moreover, future techniques

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were seen in embryo on the night of 29 August when a B-29 dropped flares in order to illuminate a bridge for an intruder B-26.⁵³

An attempt was made during September to use B-29's as ~~primary~~ intruder planes. During the full moon ~~phase of the last of~~ September 1950, the 98th Bombardment Group flew a number of sorties over enemy supply lines. The Superfortresses were ordered to stay 3,000 feet above the terrain, north of the bomb line, and 50 miles south of the Manchurian border. They were "instructed to bomb anything that appeared to be highway traffic." Despite bright moonlight, "the program left much to be desired. Roads were difficult to locate, although traffic was forced to run without lights." Bomber Command felt that this type mission was hardly worth while. "So far as the material damage inflicted is concerned, the general unsuitability of the B-29 for this type work is self-evident and results . . . disappointing."⁵⁴

When B-29 free-lancing missions proved to have little value, a new tactic was tried. The B-29's sent out on night harassing sorties carried flares as well as fragmentation and general-purpose bombs. When a possible target was sighted, a flare was dropped; then the bomber turned and attempted to bomb while the target was illuminated. This could be done at 7,000 feet or above, but not at a lower altitude, "and the operation was not considered particularly successful." This tactic did not give nearly enough time for a Norden run, and a fixed-angle D-8 Bomb sight imitation proved too inaccurate.⁵⁵

A third attempt to use the B-29 against motor transport targets involved one bomber's dropping flares to illuminate the target for another. "It was

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necessary for the bombing aircraft to fly above the flare aircraft to avoid being hit with flares that developed malfunctions. This program was carried on extensively with fair results. However, the crews did not consider their effectiveness to be adequate." Actually, the chief trouble with these missions seems to have been, first, that bombardiers attempted to bomb synchronously by means of flare illumination, and second, the excessive number of M-26 flare failures.⁵⁶

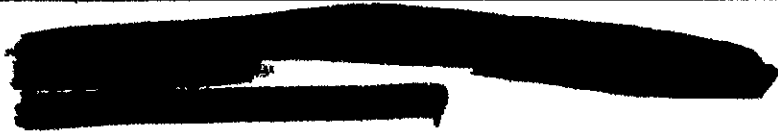
In the meantime, of course, Fifth Air Force B-26's had been carrying on their intruder sorties. Toward the end of September an effective means of illumination and attack was discovered. This involved the illumination of the target by a flare-carrying B-29, and an attack upon the target by a B-26:⁵⁷

The B-26 scouted for targets while the B-29 orbited a known point. When a target was found the B-29 was notified and flares were dropped. Results of this type of mission were spectacular and highly successful almost from the start. B-26 and B-29 pilots were very enthusiastic because of their accomplishments. Flare carrying B-29's had the advantage of large flare capacity, long range, and endurance. The B-26's had firepower and the maneuverability lacked by the B-29 at low altitude.

Unless claims are to be very greatly discounted, the results of these cooperative missions were good. The number of vehicles claimed as destroyed and damaged was large, and rolling stock also suffered. On the night of 22 September three moving trains were attacked and all were heavily damaged. "One train continued exploding for 25 minutes after the attack," reported the crew of the B-29 which had provided the illumination.⁵⁸

Flare malfunction was a constant obstacle in the way of successful missions. On the night of 29 September "The three B-29's scheduled for flare





missions in conjunction with night interdiction by B-26 aircraft experienced the same trouble with numerous flares as on previous missions of this type --^figniting too soon, too late, or not at all. " The M-26 flare had been unreliable during World War II; now, after five years in storage, it was worse than ever. In order to assure illumination, it was recommended that no less than 12 be dropped at a time. The 98th Group raised the ignition rate from 55 per^{cent} to 80 per^{cent} by adding 70 grains of black powder to the fu^{ze} as a booster, but while this did improve ignition, it made the hazard to the airplane from premature ignition worse than ever. ⁵⁹

Premature ignition and the danger of a released flare hanging up among the arming wires remaining in the bomb bay of the B-29 caused Bomber Command on 1 October to send a message to FEAF "inform^{ing} that headquarters of our intention to cancel all flare missions except those for which British type flares are to be used." FEAF concurred, and on 3 October flare missions by B-29's were formally restricted to the availability of Mark III flares. However, the British flares also proved unsatisfactory; when used on a mission the night of 5 October, they ^{turned out} proved to be "either fused incorrectly or . . . of inferior quality. Crews state that no more than 50 percent burned properly and six clusters did not burn before hitting the ground." The Navy M-6 flare was finally to prove a reliable source of illumination, but no flare missions were flown during the latter half of October, and B-29's were to fly few more during the first two years of the war. ⁶⁰

In the meantime, in addition to primary intruder missions as described



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above, B-29's had been dropping delayed-action bombs along known communications routes in the late afternoon. Both these sorties and all B-29 night tactical operations except flare drops were halted on 3 October "due to relative ineffectiveness."⁶¹ This action may have been too hasty. It is possible that Bomber Command underestimated the adverse effect these operations had upon the enemy's freedom of movement:⁶²

Although few actual targets were struck and demolished, the presence of aircraft constantly overhead, signifying the possibility of imminent attack, and the alarm and uncertainty occasioned by bombs exploding unexpectedly throughout the night induced such a state of apprehension in the enemy that he became increasingly reluctant to travel or work even in the relative safety . . . of darkness. The psychological effect of night intruders upon the enemy was repeatedly attested to by prisoners of war, and there is every reason for believing that the B-29 night intruder effort should have been increased by placing every aircraft that could be spared on such missions instead of, to all intents and purposes, discontinuing the program. The B-29 is ideally suited for such missions. . . . The B-29 was capable of roaming over vast expanses of enemy territory for long periods of time, carrying a tremendous load of bombs to be dropped at intervals in areas where the presence of the enemy is expected. Accuracy is of little importance; the bombing creates fear and fear does the work.

It seems only fair to point out here that when B-29 intrusion came to an end, targets were becoming scarce. North Korean organized resistance to the United Nations offensive was disintegrating, and the ~~intervening~~ Chinese forces had not yet appeared in strength. Indeed, B-29 crews had noted a scarcity of targets before the end of September.⁶³

The light bombers did not depend entirely upon flares dropped by B-29's for their attacks in 1950. On the contrary, vehicles with lights on could be bombed without illumination and strafed, even, if the terrain was not too

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rugged. If necessary, B-26's could provide their own illumination. On a predetermined target, one B-26 could drop flares to light up the aiming point for succeeding attackers, and this brought good results. Given targets of opportunity, however, ~~and~~ this system did not work too well. The trouble lay in the fact that it took the flare ship too long to reach the target after it was called in. Also, it too often happened that the crew of the flare ship was unable to see the target it was supposed to illuminate. A single B-26 carrying its own flares could do good work on minor objectives, such as convoys of six or less vehicles. An experienced pilot could make two passes by the light of a single flare. None of these methods seem^d to have been as effective as the B-29 and B-26 team, however. ⁶⁴

After B-29 intrusion ceased, the 162nd Reconnaissance Squadron also cooperated with radar-equipped Marine Corsairs. The Corsairs trailed the RB-26 by means of their radar, and swept in for the kill when a flare was dropped. Not enough targets were available during the North Korean retreat to give this plan a fair trial. ⁶⁵

Intrusion results had been good during the first phase of the war in Korea, although tactics were crude in comparison with those developed later. It should be noted, however, that attacks upon fixed targets, such as river crossings, were more successful than those on targets of opportunity. The 68th AW Fighter Squadron regarded armed reconnaissance as hardly worth while. Though all the methods used resulted in some destruction, B-26 strafing by the light of flares dropped from a B-29 was apparently



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the most successful tactic.⁶⁶

The units participating in these operations realized that part of the reason for whatever success was attained lay with the enemy: "the tactics employed in the Korean conflict may produce an erroneous impression . . . that operational procedures and tactics of this type could be effectively utilized during a full scale war against an effective enemy. It has been found that enemy flak to date has been generally light . . . and inaccurate. Fighter opposition has been almost negligible."⁶⁷

With large-scale Chinese intervention, the war in Korea was in a new phase. United Nations forces were again thrown on the defensive, and early in November General MacArthur asked FEAF to provide maximum-effort close support and interdiction operations both day and night. FEAF, replying to a query from General Vandenberg regarding night operations, informed USAF that the 3rd Wing would be devoted entirely to night operations as soon as the 452nd Bombardment Wing arrived in the Far East.⁶⁸

Actually, the 3rd Group did not fly as many intruder sorties during November as during the previous months, but this situation changed in December. Three squadrons of the 452nd Group took over B-26 daylight operations, and the light bombers of the 3rd Group devoted 4,554 out of 4,619 combat hours, approximately 840 sorties, to intrusion. RB-26's and the 731st Bombardment Squadron of the 452nd Group added to this total. On the nights of 7 and 8 December no less than 65 B-26 and RB-26 sorties were sent out to aid the United Nations forces retreating to Hamhung. Thus, by

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the end of December 1950, B-26's had flown almost 2,400 night intruder sorties, and added to these were the missions flown by F-82's and RB-26's. It is worth noting that this was far less than half of the light bomber sorties flown during the period.⁶⁹

The light bomber crews learned a number of lessons during these early months in Korea. Like Bomber Command, they gave up using the M-26 flare. This device was not particularly hazardous when released from the B-26, but its performance was so unreliable that it was practically worthless. The search for a satisfactory low-level bombsight for night use went on. High hopes were held for the British Mark III, but tests showed that it was not the answer to the problem. Finally the gloomy conclusion was reached that a suitable bombsight for low-level night work simply did not exist. It was generally agreed that strafing was the best method of destroying road and rail transport. Rockets could not be used because of the blinding effect upon the pilot of the attacking aircraft. Despite the destructiveness of strafing, many attacks were made with fragmentation bombs because low-level flying ~~in the kind of terrain encountered~~ in Korea was highly hazardous.⁷⁰

The enemy developed methods of countering intruder pressure. Roads presumed to be closed were found to be carrying traffic, and it was discovered that pontoon bridges were being hidden against river banks during the day and put in place at night. Sometimes, also, when attacked at night, troops with enemy convoys set fire to gasoline in an adjacent area "to give the

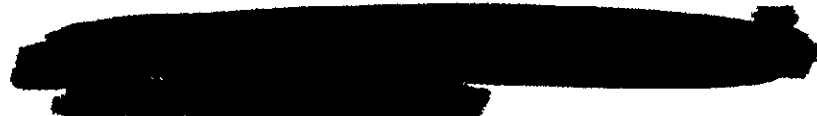
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illusion that the convoy had been successfully struck." It seems probable that this trick may not only have saved motor transport from further attack; quite possibly it led ^{also} ~~as well~~ to inflated claims.⁷¹

No claim that these intruder missions had cut off supplies and reinforcements to the Communist front lines was ever made. Nor, for that matter, was any realistic evaluation of results possible, simply because most results were unknown. There were never any photographs, and often the crews of the attacking planes observed nothing. Interrogation of prisoners of war revealed, however, "that enemy movements at night were impeded by night intruder operations. Convoys were forced to proceed under blackout conditions, and it was estimated in one prisoner of war interrogation report that convoys were only able to move from twenty to thirty miles in one night. It was also well known that enemy artillery fire ceased when planes were overhead at night."⁷²

A new system of illuminating targets came into use in January 1951. The 3rd Group modified several C-47's to carry 150 Navy M-6 flares. These flares were dropped through ramps installed in the luggage compartment, and the parachutes were opened by a static line. The first mission with one of these flare ships was flown 2 January. Targets near the front lines were illuminated by the transport and attacked by a B-26 and an F-82. Other such missions followed quickly, and the system proved to be the best yet attempted, more effective even than the cooperation between B-29 and B-26 which had been successful the previous summer. A letter from the commanding



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general of the 25th Infantry Division to the commander of the Fifth Air Force stated that prisoners described the attacks as "particularly terrifying" and said that they had "caused [enemy] night movements to become much less effective." These prisoners stated that they had been able to move only one fourth as far per night after coming under attack as they had been able to move before. ⁷³

The flare-carrying C-47's carried either a pilot or co-pilot who was experienced in B-26 intrusion and two navigators. One of the navigators used dead reckoning and pilotage while the other navigated by Loran. The flare ship had the responsibility of locating and illuminating targets, and it controlled the B-26's which made the attack. Control involved coordination of the passes so that no more than two B-26's were on the target at the same time and setting the orbiting point and altitude for B-26's waiting their turn. So that there would be no mistakes in altitude, the flare ship transmitted an altimeter pressure setting to all aircraft in the area. The B-26 was expected to check in with the flare ship when 50 miles out, to follow instruction until ordnance was expended, then to check out before returning to base. ⁷⁴

During January the flare-carrying C-47's were used near the front lines; in many cases the missions flown amounted to night close support. Deeper penetrations of North Korea began in February. Until May the C-47's were operated by the 3rd Group, but early in that month they were turned over to the 67th Tactical Reconnaissance Squadron. While under control of the

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3^d Group, these flare ships had flown 4,820 sorties.⁷⁵

By means of C-47 illumination, "many enemy convoys, troop concentrations and other lucrative targets were attacked and destroyed." It did not follow, however, that this was a tactic which could be depended upon to increase the effectiveness of intrusion in future wars. "It must be kept in mind . . . that in the Korean War we enjoyed complete air superiority [until mid-1951] and received only negligible ground fire. . . Had enemy night fighters been present or enemy anti-aircraft fire been heavier, the use of . . . the C-47 would not have been possible."⁷⁶

During February 1951 the 3^d Group flew 3,115 combat hours on night intruder missions, 87 percent of the combat hours flown. Of the night sorties flown, not all were effective by any means. Many bombers were forced to turn back when ice formed on wings or tail surfaces. Another factor limiting effectiveness was a severe scarcity of bombardier-navigators qualified to use radar equipment. Replacements were nearly all recalled World War II bombardiers who had little navigation training and no radar experience and who ~~proved~~ ^{were} most difficult to train.⁷⁷

"Tack" missions, a new method of harrying motor transport, were tried out during March, 1951. On the first mission of this sort, 16,000 pounds of roofing nails were dropped along the main roads near Pyongyang. It was hoped that the tacks would puncture tires and therefore stop trucks on the road where they could be destroyed by United Nations fighters the next morning. Dropping the tacks proved to be extremely hazardous, because the

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bombers had to fly a straight and level course along the road at very low altitude, and the results were disappointing. Only 28 trucks were destroyed by the friendly fighters which went out to sweep the roads the next morning.⁷⁸

On 14 March a specially designed tack, made in Japan to Fifth Air Force specifications, was used. This device, ~~known as a tetrahedron,~~ was a "large, heavy duty, four pointed" tack "of hollow tubular steel designed to deflate puncture-proof tires. These tetrahedrons were scattered over three heavily travelled highways, and anti-personnel bombs were dropped in the same locations. The idea was that the presence of the bombs, which were armed by striking the ground and which required only a touch to explode, would prevent removal of the tetrahedrons. Unfortunately, the results of the mission were never known because bad weather the next morning thwarted the follow-up fighter sweep."⁷⁹

The 3rd Group, in May 1951, issued a report on what it had learned about aerial night attack during a year of actual experience in Korea. No acceptable bombsight for low-altitude work had yet been found, but pilots had discovered that they could bomb fairly accurately by estimating a dropping angle and using some part of the airplane as a point of reference. Glide bombing -- approaching the target in a 25° glide and releasing the bombs at the instant of pulling out -- had proved effective. Extremely low-level bombing at night was too dangerous to be profitable under ordinary circumstances, but when it had to be done, napalm was the best ordnance yet used; parafrags had not been tried in Korea.



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The B-26 machine guns were still the most reliable weapon when the bomber could get close enough to the target to use them. It was found best to begin firing at 2,000 feet so as to check the sight and permit corrections if the setting was inaccurate. When vehicles had to be attacked on mountainous roads, it was necessary that the pull-out be made at 1,500 to 2,000 feet, and it was thought doubtful that such long-range strafing could be effective. The B-26 gunner could pin down ground fire on strafing runs, but only if he was given the necessary information in advance. Many pilots failed to give this information, and on these crews the gunner was useless.

As to flare tactics, experience had demonstrated conclusively that the C-47 with its ability to keep an area illuminated for five hours was the best flare ship. The 3rd Group study concluded that it was uneconomical for a B-26 to drop a flare for its own use. It was true that two passes could be made, but there was danger that the flare might go out on the second pass and leave the pilot blinded. Also, the B-26 which dropped flares for its own use had to make too many passes at the target for safety. The bomber had to go over the target once to locate it, again to drop the flare, and at least a third time to make its attack. While the report did not so state, the implication was plain that even the slowest antiaircraft gunner would be set to deliver accurate fire when the plane made its third pass.⁸⁰

Intruder effort was practically doubled during June when the 452nd Group was switched to night operations. Growing Communist ground fire along communications routes had forced this group to give up low-level day bombing

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and strafing in May, and the Fifth Air Force's interdiction program had little need of medium-altitude day bombers. Thanks to the training received by 452nd Group pilots on missions with the 3rd Group, the 452nd encountered no particular obstacles when it began night operations.

When the 452nd began flying at night, all B-26's in Korea were on intruder duty. This state of affairs was recognized 25 June when the six squadrons of the two groups were designated "Bombardment Squadrons, Light, Night Intruder." Tactically, June saw the use of butterfly anti-personnel bombs as a part of each night's operations. Even if these bombs did not destroy personnel and vehicles, it was hoped that the necessity for halting traffic until they were moved from the roads would slow down the supplying of the front.⁸¹

An event of July 1951 is worthy of mention. A study of claims by the 1st Marine Air Wing as compared with those of the 3rd Group indicated that the Marines, who operated almost exclusively under flare illumination, were three times as effective as the B-26's. Therefore, on 1 August, the Fifth Air Force requested that more flare ships be assigned to it.⁸²

Pending the arrival of more flare ships, B-26's in July commenced going out as two-ship teams, each plane carrying flares and a full armament load. When a target was attacked, each plane released its flare as it made a pass, thus providing illumination for the other. At the same time experiments were being conducted with a B-26 armed with two 20-mm. cannon and six .50-caliber machine guns. "Limited operations with this aircraft indicate

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that more vehicles are confirmed destroyed by burning or exploding by using this armament than is obtained by the sole use of .50 caliber machine guns.⁸³

Despite all the efforts of the intruders, vehicle sightings during July and August indicated that the Communists were moving from 500 to 2,000 vehicles nightly. It was also noted that sightings were much more numerous on moonless nights. There was some question as to whether this was a deliberate policy of the Reds, or whether more vehicles were sighted on moonless nights because they were then forced to use their lights. The latter explanation seems much more plausible, since it bears out the experience of both the 47th Group and the RAF during World War II. In fact, in September 1950 ~~Wing Commander~~ ^{w/c} Peter Wyndham-Barnes, RAF, had predicted that after intruder crews became experienced, they would have better results on dark than on moonlight nights.⁸⁴

Intruder operations during August 1951 were unusually profitable. A number of ~~factors contributed to bringing about this state of affairs.~~ In the first place, as noted above, all Fifth Air Force B-26's were now on intruder duty. Secondly, the ~~3rd~~ ^{3rd} Group moved its base from Japan to Korea during August, thus increasing the time its planes could spend over enemy territory searching for targets. Lastly, the rail interdiction program engaged in by Fifth Air Force fighter-bombers and, to a lesser degree, Bomber Command, forced the Communists to use more motor transport.⁸⁵ The effectiveness of operations for the month, as well as new tactics used, is made evident by





the following quotation:⁸⁶

The 3^d and 452d Wings experimented to improve the effectiveness of their interdiction attacks upon vehicles. Tests flown during the month by the 3d Wing showed that horizontal, synchronous bombing of vehicle convoys from 6,000 to 8,000 feet altitudes with 500-lb GP bombs, VT fused, were [sic] providing excellent results, while the 452d Wing found vehicle hunting most profitable if its aircraft carried a full complement of armament rather than relying upon armor-piercing incendiary (API) ammunition alone. A combination of bombs and API proved most deadly when bombs stopped an enemy convoy permitting friendly aircraft the choice of strafing a "dead" group of vehicles or of using more bombs. The 3d Wing claimed over 1,900 vehicles destroyed or damaged and the 452d Wing over 3,600 vehicles destroyed or damaged during August, which accounted for well over 90 percent of the 5,900 vehicles claimed . . . by all Fifth Air Force units during the month.

At this point it might be well to discuss an interesting experiment, designed to permit the B-26 to illuminate its target at the instant of attack.

An idea originally developed by the RAF and the Navy for use in night attacks

on submarines was applied. This consisted simply of mounting a searchlight on the attacking plane. The AN/AVQ-2A searchlight, mounted under the wing of the B-26, seemed to hold promise. The light required no warming up, gave a narrow but strong beam for 30 seconds, and illuminated targets up to two miles away.

MoH Thirty-seven of these searchlights were delivered to the 3^d Group, and it was quickly demonstrated that motor transport could be destroyed with their help. One B-26 equipped with the searchlight destroyed five trucks and damaged five more in two passes at a 15-truck convoy. Unfortunately, other facts were also demonstrated by the first missions with the new equipment. The light made too good an aiming point for ground gunners. The first



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plane to make a pass with the searchlight was shot down. Also, the light proved useless when ground haze was present. Lastly, the 3rd Group encountered an inordinate amount of maintenance difficulty in installing and servicing these searchlights. Hence, on 15 November 1951, Fifth Air Force recommended that the experiment be given up.⁸⁷

During the six months ending 30 September 1951 the Fifth Air Force ~~claimed~~ to have destroyed 10,703 vehicles in North Korea. Eighty percent of these, 8,550, were claimed by the 3rd and 452nd Groups, and these two organizations claimed 90 percent of the vehicles claimed as damaged. Also listed for the intruders were ^{45 percent} ~~52~~ out of the ~~115~~ locomotives claimed, 29 percent of the railroad cars, 21 percent of the artillery, and 19 percent of the bridges. Yet the two B-26 groups had flown only 16 percent of Fifth Air Force sorties. Adding to the total during the last of the period was the continued use of 500-lb proximity-fuzed bombs.⁸⁸

The evaluation of actual destruction accomplished by intruders had been a problem in World War II, and it continued to be so in Korea. No criterion for evaluating results was available except the claims of the units concerned, but it is highly probable that these claims were excessive. It seems most unlikely that 100 obsolete B-26's were, as Fifth Air Force proudly claimed, destroying 15 percent of total Chinese and Russian truck production. Some such feeling must have existed at Fifth Air Force headquarters, because at the end of September 1951, intruders were ordered not to claim vehicles as destroyed unless they were "seen to explode or burn."⁸⁹

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Several new tactics were used in December. The 452nd Group began utilizing the British Mark IX bombsight for visual drops. This fixed-angle sight, while not so accurate as the Norden, did not require so long a bomb run. This unit also conducted experiments in marking targets with M-90 target identification bombs, and it used tracer ammunition at night for the first time since the early days of the Korean War. A new-type mission for the campaign took place on the night of 23 December when a 3rd Group B-26 flew a searchlight-suppression mission in connection with a B-29 raid on Uiju. The intruder was reported as having destroyed eight searchlights, although many others remained in operation.⁹⁰

An analysis of night intruder missions revealed that the average B-26 on an intruder sortie made two or three attacks. About one sortie out of ten resulted in six or seven attacks. As for armament, the 452nd Group used bombs alone on 62 percent of its passes, and the 3rd Group depended upon bombs on 55 percent of its attacks. The 452nd strafed 25 percent of its targets, the 3rd 17 percent. Of claims registered by the two groups, the 452nd recorded 60 percent by bombing, 17 percent by strafing; the 3rd accomplished 47 percent of its damage and destruction by bombing alone, only five percent by strafing alone. Twenty-three percent of the claims by the 452nd Group resulted from a combination of bombing and strafing, as did 48 percent of the 3rd Group's claims.⁹¹ The conclusion, that intruder aircraft should be prepared (to either) bomb or strafe, was obvious.

On 1 January 1952 there were 49 B-26 sorties over Northern Korea, and

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114 vehicles were reported as destroyed. This brought the total claims of vehicles destroyed since 25 June 1950 to 37,834. Damage claims amounting to 28,841 were also registered for the war. To this date, only 30 B-26's had been lost to ground fire, and only 45 had suffered damage. Of this number, quite a few had almost surely been lost early in the war when the light bombers were flying low-altitude missions in daylight. Only one B-26 had been damaged by hostile aircraft, and none had been lost as a result of enemy aircraft action. One loss was due to unknown causes, however. Thus some 1,280 enemy vehicles had been claimed destroyed for every B-26 lost due to enemy action. Even if the light bombers had claimed only 80 percent of the vehicles reported destroyed, they still had destroyed, on the basis of their claims, almost 1,000 vehicles for each bomber lost to the enemy. In addition to vehicles, of course, supplies and personnel also suffered from intruder attacks.⁹²

Fifth Air Force intruders were out every night during January, and on only three nights were they less than 48 strong. The sortie total for the month was 1,467, and 2,240 vehicles were claimed as destroyed. Thus each B-26 sortie, on an average, resulted in the destruction of 1.5 trucks. This was accomplished at a cost of three bombers lost and four damaged. Strafing was made less hazardous for 3rd Group crews by the installation of AN/APN-1 absolute altimeters in the nose of the group's airplanes. The beam from this instrument was directed forward at such an angle that a warning light flashed when the plane came too close to the ground on a strafing run.⁹³

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During February the light bombers were out on intruder sorties every night save one. From 47 to 52 sorties were over enemy territory on every operational night for a total of 1,364. During the month 1,991 vehicles were destroyed ~~7--~~ 1.45 per sortie ~~2--~~ at a cost of ~~one~~ B-26 lost and ~~nine~~ damaged. During this month, also, the 3rd Group began sending its replacement crews on day missions in order to familiarize them with the Korean terrain before they began flying intruder sorties. As the result of a study of past performance and losses, the 3rd Wing concluded that moonlight sorties were hardly worth the trouble except against trains. Vehicle sightings and destruction were lowest when the moon was bright, and battle damage in relation to claims was highest.⁹⁴

Claims registered for January through March 1952 bear out the contention that results were best during the dark of the moon. In January the first quarter did not appear until the 4th, and the moon was full on the 12th. The sequence of claims for the first 12 days of the month was as follows: 114, 106, 49, 65, 117, 104, 68, 37, 34, 6, 21, 41. The last quarter in January came on the 20th, and the new moon did not appear until the 26th. The sequence of claims from 15 ~~January~~ through 26 January was as follows: 52, 36, 111, 139, 55, 104, 21, 117, 177, 163, 58, 54. To repeat the sequences for February and March would be too repetitious, but with the inevitable nights of poor hunting because of weather accounted for, the same pattern holds.⁹⁵

No new tactics in night intrusion were developed during the first six months of 1952, except that in some cases flares were fused ⁷ so as to ignite

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below the attacking aircraft as a defense against increasing ground fire. Fifth Air Force claims of vehicles destroyed for the period amounted to 18,532, of which more than 75 percent were claimed by intruders. A tendency toward use of B-26's for night strikes against supply dumps and troop concentrations when the moon was bright was evident in June, but on dark nights intrusion was still the rule.⁹⁶

Enemy opposition to night operations in Korea. Night operations in Korea met their chief opposition from antiaircraft fire. As soon as night intruder sorties began to take a heavy toll of the vehicles carrying supplies to the front, flak traps began to be noted; these traps were baited with "seemingly lucrative military targets." When Communist truck convoys moved "through mountainous terrain . . . troops would be stationed on the hillside so as to set up an effective cross fire with small arms in which to trap low flying aircraft making . . . strikes against the convoys." Most of the planes lost or damaged fell victim to "small arms ground fire."⁹⁷

During its combat career through January 1952, the 3rd Group lost 119 aircraft. Three of these were lost on training flights and three by transfer. Of the remainder, 67 were lost at night. None of these were known to be lost to enemy aircraft. One was accounted for by weather, ¹four by combat accidents, ⁴four by running out of fuel, 14 by ground fire, and 16 by landing or takeoff accidents. The remainder were missing in action. Since many of the planes and crews missing in action were undoubtedly lost to ground fire, it seems probable that such opposition was responsible for about half

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the planes lost on combat missions. Whether combat accidents, such as flying into mountains, or takeoff and landing accidents were responsible for the next largest number of losses cannot be determined.⁹⁸

In mid-1951, when Fifth Air Force's all-out day and night interdiction campaign was well under way, many Communist antiaircraft guns were moved from cities and airfields and placed along communications routes. By October, flak was definitely on the increase, and it was better served. Searchlight and antiaircraft cooperation was much improved. Moreover, the gun-laying radar used by the Reds proved to be better than anything the Soviet Union was known to have. Its performance seemed to be as good as that of the American SCR-584. There were reports that the Communist batteries might be firing proximity-fused shells. During November the number of known heavy antiaircraft guns in North Korea rose from 290 to 363.⁹⁹

B-29's met the most concentrated antiaircraft fire, though not necessarily the most deadly. Targets such as Pyongyang and Uiju were especially well defended. During December 1951 medium bombers attacking Uiju were coned by searchlights from the IP to the target on two nights, but the use of chaff seems to have reduced the effectiveness of the guns somewhat. The 19th Group reported receiving flak on all but one of the missions flown during December, but the group lost no planes and suffered only two damaged from all this opposition. As of 20 June 1952 a total of 19 B-29's had been lost to enemy action, and only ~~six~~¹⁰ of these had fallen to ground fire.¹⁰⁰

Inasmuch as fighters forced the medium bombers out of the daylight air,



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there can be little questioning of a conclusion that the B-29's suffered fewer losses by night than by day. The same thing would seem to be true of B-26's. The 452nd Group suffered light losses, by World War II standards, when it operated in daylight. From October 1950 through June 1951 this unit flew 4,469 sorties and lost 19 planes, or 0.42 percent. During the last three months of 1951, the 452nd flew 2,708 sorties, of which all but 51 were at night, and lost only ²two planes.¹⁰¹ Thus the loss rate during this three-month period when much the greater part of the group's flying was by day was almost six times as high as for a period when most flying was done at night. This was true even though more antiaircraft guns were present along the communications routes over which the B-26's operated in late 1951.

The Communists in Korea lacked a radar-equipped night fighter. This was the main reason for the low loss rate of night bombers and intruders. Night flying enemy aircraft were observed by United Nations radar or aircrews each month after Chinese intervention. Sometimes these planes attempted interception, but, except for a few cases in which attacking bombers were coned by searchlights, were never able to make interception effective. Whether AI night fighters could have brought a halt to night forays by United Nations aircraft cannot be known, but there can be little doubt that they could have made night operations more costly and, probably, less effective.

Apparently most of the enemy night sorties observed were made by conventional propeller-driven planes -- ⁱⁿ many cases the light PO-2. This changed in April 1951, when Type 8 twin jet aircraft, the Russian version of

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the ME-262, were sighted by B-26 night intruder crews. There were a number of instances during May of probable Type 8's making passes at B-26's, usually when the light bomber was at the end of a strafing run. No United Nations planes were damaged by these attacks. The B-26 crews found that the best tactic was not to return fire; as a result the jets were unable to maintain visual contact with the intruder.¹⁰²

In late October 1951, when United Nations medium bombers found it necessary to resort entirely to night missions, the enemy evidently made a strong effort to counter this new development by night interception. Repeated passes were made at a B-29 by two single-engine jets on the night of 22 October. No damage was done to the bomber, and it was noted that the fighters broke away at 500 yards. During November 67 night sorties by the Communists were observed, and on the night of 16 November a B-26 received major damage from two conventional fighters when it was coned by searchlights. Five probable Type 8's kept a B-29 boxed almost all the way across the Korean Peninsula on the night of 22 November, but were unable to inflict any damage. A B-29 coned over Uiju^{on} 28 November also escaped without damage despite attacks by three jet fighters. There was some evidence, in the manner in which the bomber attacked^{on} 22 November was trailed, that the Communists had finally developed an AI night fighter. Apparently FEAF fears were groundless in this instance.¹⁰³

In December 1951 Communist night fighter activity was more successful than it had been in previous months, but still there was no known case of a

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United Nations plane being destroyed by such an attack. An experiment originally attempted by the RAF during World War II was observed on the night of 10 December when a B-26 was illuminated for a few seconds by either the landing lights or a searchlight on the wing of an unidentified airplane. During the month, no less than 15 firing passes were made at night at Fifth Air Force aircraft, but none of these indicated the presence of airborne radar. Night interceptors over North Korea were learning to work in cooperation with searchlights, however. "In an attack on Uiju Airfield several B-29's suffered major damage as a result of enemy night fighter attacks conducted with the assistance of illumination from searchlights."¹⁰⁴

The enemy's attention to fighter-searchlight cooperation paid him dividends, finally, in June 1952. A Shoran mission against the Kwakson Railroad Bridge encountered tracking searchlights and 12 MIG fighters. The MIG's pressed their attacks home, and succeeded in shooting down two bombers while inflicting major damage upon another. "This attack was a well planned, integrated effort, with seeming ground to air and air to air coordination." It is interesting to note that the two B-29's shot down this night were the first lost to enemy action since the preceding February.¹⁰⁵

As of 30 June 1952 United Nations night bombers faced the probability of occasional losses to fighters when attacking targets defended by effective searchlights. The best defense seems to have been to jam radar-directed searchlights by electronic means or by the use of chaff. "However, in the restricted area in which the B-29 aircraft usually operate, the necessity

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for making bombing runs on standard Shoran approaches and the necessity for single plane attacks contribute greatly to increasing the danger of interception by enemy jets and the constant possibility of fighter traps.¹⁰⁶ The same logic would seem to have applied to B-26's, except that their lower operating altitude might well have afforded them some protection. There was little possibility that night bombing and intrusion would be brought to a halt by excessive losses so long as the Communists did not introduce an AI-equipped night fighter into the Korean War.

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CONCLUSIONS

Night fighters. It is somewhat difficult to arrive at a critical evaluation of the ~~Air Force's~~ ^{AAF's} overall use of night fighters for defensive purposes in Europe during World War II. It is evident that American and RAF night fighters and antiaircraft artillery were able to make night raids costly for the Luftwaffe and even to hamper German night reconnaissance. On the other hand, the Germans were able to mount night raids against Allied bases with some hope of success almost until the end of the war, but such raids could be expected to result in losses. Damage such as was inflicted at Bari Harbor or at the airbase at Alesan, Corsica, more than justified the losses which were incurred. But there were scores of raids which effected far less destruction but which incurred losses just as high. It is safe to say that after the battle between American night fighters and German bombers was joined, night fighter defense was adequate to meet the effort the Luftwaffe exerted. Had the Nazis been able to withdraw planes from Russia in great numbers, or had the two-engined aircraft used as night fighters to oppose RAF bombing of German cities been free to operate against Allied positions, the story might have been different.

To point out specific shortcomings is simpler. In the first place, night fighters were needed in Africa in 1942 and early 1943, and they were not available. Nor were enough American squadrons on hand in the Mediterranean to bear their share of the load until the Italian Campaign was well under way.

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The planes provided for the American squadrons were not all that they should have been. The Beaufighter was a much better night fighter aircraft than the P-70, but it could not compete with the Mosquito or the Black Widow. Moreover, as the war neared its end, the Beaufighters in use became more and more worn and unreliable. By late 1944 this had created a morale problem in at least one unit. When introduced, the P-61's were good intruders, but they arrived too late to prove themselves against the Luftwaffe. Even after P-61's were on the scene, the squadrons in Europe did not have enough of them for a large-scale intruder effort, nor did they have parts and replacements for the ones they had.

Personnel returning from the European Theater of Operations registered other complaints. Replacement crews had not had sufficient flying time in the P-61 and, perhaps on this account, lacked aggressiveness. They preferred to fly only routine patrols, and did not perform well on intruder sorties. Inasmuch as they had been trained for defensive patrol, this was not surprising. It is perhaps significant that in the Pacific, where defense against enemy bombers required so much attention that P-61's did not fly as intruders until later in the war, there was little complaint about the quality of replacements.

While the evidence is not conclusive, it would appear that British AI equipment was more reliable than that mounted on the P-61. There were relatively few complaints regarding radar malfunction on the Beaufighter, but this was a serious problem with the P-61 both in Europe and the Pacific.

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Confusion, inescapable in war, was responsible for some of the troubles of the night fighters. When American GCI controllers replaced the British veterans in that office, confusion almost always ensued. Coordination with the ground forces and other air units was often lacking, also. Patrols were frequently fired on by ^{friendly} antiaircraft, especially when operating near naval vessels, as was the case at Anzio and off the beachhead in Southern France. In fairness to the antiaircraft crews, it should be stated that ^{some mistakes of course} ~~much of this confusion~~ resulted from planes flying over forbidden zones.

Any assessment of the role of night fighters in the Pacific must be qualified in many respects. When Japanese night raids were most annoying, there was no suitable night interceptor available, although searchlight cooperation tactics did afford a deterrent. At Saipan the night fighter defense of the island was, for all practical purposes, effective. The same statement might be made in regard to Iwo Jima. On the other hand, night fighter defense of Morotai and the Tacloban ^{Airfield} on Leyte did not check the Japanese attacks. Extenuating circumstances, such as the unfavorable terrain at Morotai and the condition of the airstrip at Tacloban, could be pointed out. Nonetheless, the Japanese bombs continued to drop in each case, despite P-61 patrols.

Japanese night bombing did become more infrequent and weaker after the early fighting in the Philippines. Some credit for this decline in Japanese night effort must, probably, be given to American night fighters. They destroyed enough Japanese planes to make it clear that night attacks were

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hazardous enterprises. But the role of the night fighters should not be overemphasized. The P-61 did not reach combat until mid-1944. Yet, since Guadalcanal, each new Allied beachhead suffered fairly heavy night attacks at first, but within a few months these attacks ceased or became rare. This happened before P-61's were on hand to meet these raids. The fact that the raids continued to become less severe on each new beachhead with the passage of time need not reflect any credit on the night fighters. Indeed, not since Guadalcanal had there been raids as heavy and persistent as those made on Morotai, and night fighters were on hand there to oppose the attackers.

Japanese air power suffered constant attrition from day bombing and strafing of airfields, daylight losses in aerial combat, and day and night losses to antiaircraft. Losses from all these causes reduced night bombing potential. So did the Snooper patrols and submarines which destroyed supplies destined for Japanese air bases. No doubt the damage inflicted by night bombers was less because the P-61's were on hand to oppose them. However, victory in the Pacific would certainly not have been denied, nor, probably, would it have been delayed had there been no American night fighters. On the other hand, the cost of victory might have been much more in both lives and material.

In Korea there was no test of night fighters during the first two years of the campaign. The new jet interceptors proved unable to prevent bombing of Allied positions by light liaison planes, but they were hardly designed for

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such a contest. Whether or not the presence of the F-82 and its successor, the F-94, had deterred Communist bombing was known only to the Communists.

Night bombing. A few conclusions are evident in regard to night bombing in World War II. American night bombing from the British Isles was a grudging experiment. It served only to prove that the B-17 was unsuited for night bombing without extensive modification, that B-26's operating at night were easy prey for German night fighters, and that American crews, especially navigators, needed a great deal of training and experience in order to become proficient at night bombing.

Operations in the Mediterranean revealed that B-25's could be used for night operations, but that they met with a high loss rate if determined opposition was encountered. In large measure this was due to the exhaust flame and, to some extent, antiaircraft gunners. Indeed, this quality of the B-25 was a hindrance to night operations in all theaters in which it operated.

Only in the war against Japan was night bombing carried out by American units on a (large enough scale) to provide a real test during World War II. Visual night bombing was never as good as medium-altitude day bombing, other things being equal. Only when day bombing was very poor was it excelled by the results obtained at night, and this continued to be true, even when radar became available, until the 315th Bombardment Wing used its AN/APQ-7 radar to destroy the Japanese oil industry. Therefore reasons other than better results dictated the use of night bombing tactics in the Pacific.





Night bombing, before the B-29 operations against Japan, was a ~~product~~ ^{result} of the vast Pacific distances. Fighter escort could not accompany heavy bombers across a thousand miles of water. ~~Practically all the targets bombed at night were defended strongly by Japanese fighters.~~ To have consistently bombed Rabaul, the Marshalls, Truk, Bangkok, Borneo, or Formosa by day when those bases were at the height of their defensive strength would have been to invite unbearable losses. Japanese day fighters were much more deadly than Japanese antiaircraft, but their night fighters, which did not have airborne radar, were weak. Therefore, until such bases had been pounded a long time, or until they had been brought within range of medium bombers and fighters, they could be bombed only at night.

To some extent night bombing was also a matter of choice. Japanese raids upon Allied positions at night had demonstrated that such attacks were effective beyond the casualties and material destruction inflicted. The necessity for taking to slit trenches several times a night caused much loss of sleep and a corresponding reduction in efficiency. Since Japanese harassing attacks had this effect upon Allied personnel, there was no reason to suppose that the Japanese would be invulnerable to like harassment. It was also believed that night bombing, long continued, would have a strong adverse effect upon enemy morale when it became evident that defenses could not interfere. Investigation in Korea seemed to indicate that night harassment in that war brought dread greater than that caused by day bombing. Whether it followed, in the Pacific or in Korea, that the enemy's ability to wage war





was thereby reduced cannot be definitely stated.

For night bombing to be effective against comparatively small targets, a number of conditions had to be met. In the first place, highly skilled crews were a necessity. Navigation had to be precise if a target was to be located at all at night. A great many crews and planes were lost at sea, or forced to bail out over land, as a result of poor navigation. Pilots had to be proficient in landing and taking off at night, and they had to be able to make such landings and takeoffs on fields which lacked many of the aids they had become accustomed to in training. Bombardiers had to be able to spot their targets under conditions of poor visibility and to aim quickly and accurately. Radar men had to be skilled in the care and use of their equipment and in coordinating their efforts with those of the pilot, navigator, and bombardier. All of these skills were needed, of course, for day bombing, but were more in demand at night. If night bombing required greater teamwork on the part of the crewmen, to some extent it satisfied its own requirements. In the darkness each plane was alone. There could be no dependence upon following the leader, as was too often the case in daylight. Each crew was a combat unit in the true sense, facing the enemy without aid from others. Thus the crews who consistently flew night missions built up an esprit de corps not always found on day bombers.

The skills needed for night bombing were best developed when the crews specialized in night bombing. This was evident in the record of the Seventh Air Force during the first half of 1944, in the case of the 315th Wing's





missions over Japan, and in the bomber and intruder units which participated in the first two years of the Korean War. There was too much difference in piloting, navigating, and bombing by day and in carrying out these same duties at night. Crews could not be equally proficient night and day.

Better landing fields were needed for night missions than were absolutely essential for day missions. By day even heavy bombers could be maneuvered enough to get in and out of fields surrounded by mountains, but at night, when the mountains were invisible, such a field could not be used. The history of World War II includes too many instances of B-24's crashing on night takeoffs from short, poorly graded, and poorly illuminated runways.

Not all targets were suitable for night bombing, and this was especially true before the introduction of electronic equipment. Even with radar, inland targets lacking some outstanding terrain feature evident to the eye or defined on the radar scope could not be successfully attacked. The failure of the night attacks on Hollandia, insofar as hitting the target was concerned, was a case in point. A small island was the best night target; it could be easily identified by radar, and often, even on a dark night, the surf could be seen by human eyes. White coral runways made target identification and bomb aiming still more accurate. Targets on large islands or near the coastline were next best. In such a case the target vicinity was easily located, visually or by radar, and even though the target itself remained obscured, it might still be hit by offset aiming or by a timed run from some nearby



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known point. Cities, even when they were inland, were usually revealed by radar, and were often visible. Therefore the city as a whole could be bombed, though attempts to hit specific targets within the built-up area usually failed. With inland cities, however, a river sometimes furnished a reference point for radar or visual sighting which served the same purpose as an island coast line. Because they were always near the water, wharves, warehouses, harbor installations and moored shipping were especially vulnerable to night attack.

Before the advent of the 315th Bombardment Wing with its APQ-7 radar, radar bombing in World War II could never compare with visual bombing in accuracy. On radar runs the bombsight, with data preset, was used to direct the bomber so that the bombardier could bomb visually at the last minute if he saw the target. In Europe the British had carried the art of defining targets with marker bombs to a high point, but in the Pacific this practice was never carried far. Even the B-29 raids utilized ordinary incendiary bombs as target markers.

In the strategic bombing attacks on Japan the 315th Wing achieved results comparable to visual bombing. It should be noted, however, that the Japanese oil installations met the specifications set up above for good radar targets. In Korea electronic bombing again was equal to visual results when Shoran and MPQ-2 ground radar were utilized. Presumably, Shoran and MPQ-2 gave accuracy greater than could be expected with APQ-7 radar, but it was noticeable that no B-29's under FEAF were equipped with APQ-7

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before Shoran and MPQ-2 sites were in operation.

Moonlight, of course, supplied the best illumination for night bombing during World War II. On the Pacific atolls, coral runways were easily visible in moonlight, and could be bombed with a normal synchronous bomb run. Sometimes it was possible to fly formation in moonlight. In at least one case, medium bombers managed to knock out a bridge by low-altitude moonlight bombing. Other things being equal, the brighter the moon, the better the night bombing results obtained in the Pacific during World War II. In other words, the more closely night bombing conditions approximated daylight conditions, the more accurate the bombing.

Bright moonlight was not always available. When visual night bombing was necessary without moonlight, flares might be used to illuminate the target. The use of flares was seldom a satisfactory expedient, however. Even when the flares ignited and were dropped the right distance upwind, timing had to be almost perfect if the succeeding planes were to bomb before the flare burned out. Even more of a handicap, was the fact that the M-26 flares were simply not dependable. ^{Navy} ~~(They were)~~ dangerous cargo in a bomb bay, but, even worse, they were often duds. Complaints of this quality of the flares were recorded by practically every ~~Air Force~~ unit which used them. Apparently from 25 percent to 50 percent of the flares dropped could be expected to fail to ignite. This state of affairs continued into the Korean War, and led finally to the use of Navy flares for illumination for intruders and night close support.

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The most successful system of making targets stand out for visual bombing in the Pacific was the dropping of incendiary bombs. This tactic was most successful when built-up areas, such as cities or port installations, were the target, but airfields were often successfully marked with incendiaries. A few pathfinders went ahead of the main force and scattered the incendiary bombs over the target. If the bombs started any fires, the planes which came after had a visual aiming point. Navigation was also simplified, because fires were visible for many miles at night. Objections to this system were strong. If the pathfinders missed, then the whole force bombed the wrong target. Also, over Japan, it was found that smoke from fires started by the pathfinders obscured the aiming point for succeeding planes.

It has been brought out in this study that American night bombing in Europe, on the scale in which it was carried out, brought higher losses than day bombing, and that the reverse was true in the Pacific. There can be little doubt that this was due to the stronger defenses provided for German targets. Although the British did a great deal more night bombing in Europe than was done in the Pacific prior to the B-29 attacks on Japan, it is almost certain that the tactics used against Rabaul, Truk, and other such targets would have failed in Europe. German targets were harder to locate; in most instances they were far from any easily identified coastline. German cities were defended by more guns, bigger guns, better guns, and better-handled guns than were available to the Japanese. Moreover, the



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Germans had radar-equipped night fighters, and the Japanese had none. The RAF avoided excessive loss by jamming radar equipment, sending out elaborate feints, and, above all, saturating the defenses by putting as many planes as possible over the target in as short a time as possible. The small-scale tactics used in the Pacific could hardly have penetrated such defenses as the Germans had, but they were suitable for the war in which they were used.

Likewise it is doubtful if the B-29 tactics could have succeeded over Germany. Only a few Japanese targets, notably the Tokyo area, had really formidable anti-aircraft defenses. These were not comparable to what the Germans had to offer, but they did take a heavy toll of low-altitude night bombers. Many of the secondary Japanese cities were practically undefended. No doubt the B-29's could have bombed Germany at night, but they would have needed higher altitude ^{and} therefore lighter bomb loads ^{and} more electronic jamming, and more concentration of planes over the target. Even then, considering the superiority of German anti-aircraft and night fighters, losses would almost surely have been higher than they were over Japan.

The early B-29 experience over Japan demonstrated that day bombing from very high altitude could succeed only under ideal conditions. Korea demonstrated that bombers of World War II vintage could not stay in the air when opposed by jet fighters even when the bombers had jet escort. The 315th Bombardment Wing demonstrated that large industrial targets could be successfully bombed at night by radar. In Korea the use of Shoran and MPQ-2

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permitted successful night bombing of pinpoint tactical targets. These facts did not conclusively prove that night bombing was to be the rule in the future, because the newer jet bombers were untried in combat, but the indications were strong.

Night close support. Night close support was almost non-existent during World War II. SCR-584 was used to some extent in Italy shortly before the close of the conflict in Europe, and it had made its appearance in France before VE Day. Shoran was also in use in Italy. These devices were thought of, however, as a means of bombing through overcast in daylight, and were used at night only on a limited scale. Night fighter patrols over the front lines to observe enemy artillery, and in many instances to silence it, might be considered as close support. Such patrols were flown both in Europe and the Pacific. It was perhaps true that the greatest contribution of these patrols was to the morale of Allied ground troops.

In Korea night close support missions had a more distinguished part to play. By flare illumination, fighters and light bombers actually succeeded in giving strafing support to ground troops within sight of the front lines. Successful as this tactic was in Korea, its practicability in a full-scale war was questionable. Against an enemy equipped with night fighters, the survival of the slow flare ships would be doubtful.

Even more successful was the utilization of proximity fuses and MPQ-2 radar for night close-support bombing. Air bursts of ordinary 500-^{lb} ~~lb~~ ^{from} general-purpose bombs proved deadly against enemy troops grouping for an offensive. Apparently, also, the technique used gave such accuracy that

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friendly troops were not exposed to danger from these attacks. However, the meaning of the success of this tactic in Korea was obscured. No one could know what effect the presence of enemy AI fighters might have on such close-support bombing. Even more questionable was whether night close support on the scale accepted in Korea could be carried out in a full-scale war.

Intrusion. Any evaluation of intrusion in World War II, or in Korea, was mainly speculation. No way was found for determining the actual destruction effected by intruders, nor could the effect of this destruction upon the enemy's ability to fight be estimated accurately. It was generally agreed that night intrusion, as a complement to day interdiction missions, was needed long before it was used.

The experience gained both in Europe and in Korea showed that single-seat fighters were not satisfactory intruders. Night fighters and light bombers could carry out such missions, but they were far from ideal intruder planes. There was need for an airplane specifically designed as an intruder, and this need had not been satisfied by the end of the first two years of war in Korea.

Intrusion had no important part to play in land warfare in the Pacific, because the campaigns were, in the main, amphibious. Snooper SB-24's were the most effective intruders there, but their actual accomplishments are undiscoverable behind a screen of highly exaggerated claims. Intrusion against land targets mainly accomplished nothing more than harassment,





though some success was enjoyed in preventing the use of enemy airfields at night.

As vague as the results of intrusion were in the Pacific, little more can be said in regard to Europe, though such sorties were carried out there on a much larger scale. Quite a bit of destruction of motor and rail transport was accomplished, and it seems possible that the actual results were greater than the claims.

Intrusion apparently needed to be evaluated as a part of the whole scheme of interdiction. It would seem axiomatic that an interdiction campaign could not succeed unless it managed to cut off the movement of supplies and personnel at night as well as during the day. Since day sorties could not stop night movements, intrusion was an essential part of interdiction. Neither in World War II or in Korea, however, was intrusion effective enough to cut off supplies from a static front. Until intruders could "see" as well as day fighter-bombers, intrusion could not possibly be as effective as daylight fighter sweeps. Intrusion was a necessary but imperfect complement to day interdiction operations.

Even on a static front, intrusion might bring true isolation to the battlefield if it could be made as effective as day interdiction. ~~Until night intruders could "see" as well as fighters engaged in a daylight road sweep, this was impossible.~~ No tactic used in World War II or in Korea even approached the satisfaction of this condition.

Summary. Night fighters of World War II vintage could not turn back a



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determined night bombing attack, but they could make it costly. The capabilities of modern night fighters have not been demonstrated in Korea. Before the advent of the 315th Bombardment Wing over Japan, night bombing in World War II was not as accurate as day bombing. Presumably, then, it was not so effective. It could be carried out against Japanese targets, however, when day bombing was impracticable. In Korea night bombing within range of ground radar stations has proved practically as accurate as visual bombing. When not opposed by AI night fighters, night bombing has ~~proved~~ ^{been} much less costly than day bombing. The Korean War saw the development of true night close support, though the tactics used there may not have been suitable for use in a full-scale war. Until incomparably better intruder planes appear, intruder tactics cannot be fully effective unless the supply situation of the enemy ground forces is critical as a result of friendly ground force action. As carried out in World War II and in Korea, intrusion was chiefly a method of harassment.

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GLOSSARY

AA (or AAA)	Antiaircraft artillery ✓
A/C	Aircraft ✓
A/D	Airdrome ✓
AI	Airborne interception radar, radar carried aboard a night fighter and used for tracking hostile aircraft ✓
AN/APN-1	A type of absolute altimeter ✓
AN/APQ-5	LAB radar, used mainly for bombing shipping ✓
AN/APQ-9	Loran navigation equipment ✓
AN/APQ-13	Airborne radar used for navigation and bombing ✓
AN/AVQ-2	Airborne searchlight ✓
API	Armor piercing incendiary ammunition ✓
APN-60	Airborne radar beacon ✓
ARN-1	A type of absolute altimeter ✓
ASV	Air to surface vessel radar ✓
Beaufighter	British night fighter aircraft ✓
Beaufort	British light bomber ✓
Black Widow	The P-61 night fighter ✓
Blenheim	British light bomber and night fighter ✓
Blip	Indication of a reflected object, such as an aircraft, on a radar cathode ray tube ✓
Bogey	An unidentified or hostile aircraft ✓
Boston	British designation of A-20 light bomber ✓
Buzz Bomb	German V-1 guided missile ✓
Catalina	Navy PB2Y amphibious patrol bomber ✓
Chaff	Strips of metallized paper dropped from aircraft to jam radar ✓
DR	Dead reckoning navigation.
E/A	Enemy aircraft or enemy action.
ECM	Electronic radar jamming device ✓
ETO	European Theater of Operations ✓
EUSAK	Eighth United States Army in Korea ✓
FEAF	Far East Air Forces ✓
Fire Blitz	B-29 incendiary campaign against Japanese cities.
Flak	Antiaircraft fire.
Flying Fortress	B-17 heavy bomber.
Free lance	Adjective used to describe a mission on which a night fighter attempted to intercept hostile aircraft without help from the ground. Also used as a verb meaning to carry out such a mission.



- GCI Ground control interception, ground control for night fighters.
- Gee British radar navigation device.
- GP General purpose, designation of a type of bomb.
- Havoc British designation of night fighter version of A-20 attack bomber.
- HEI High explosive incendiary ammunition.
- IFF ~~Interrogator-Friend or Foe~~, radar device for identification of friendly aircraft.
- IP Initial point, the point from which a bomber begins its bombing run on a target.
- LAB Low altitude bombing radar set used mainly for bombing shipping at night, AN/APQ-5.
- LB-30 Early heavy bomber, much like the B-24.
- Liberator Name given to the B-24 bomber.
- Lightning Name given to P-38 fighter.
- LST Landing Ship, Tank, ~~naval assault craft.~~
- ~~Luftwaffe German Air Force.~~
- Marauder Name given to World War II B-26 bomber; not the same plane as the B-26 used in Korea.
- ~~Milk run A bombing mission against a familiar target where little or no opposition is expected.~~
- Mitchell Name given to B-25 bomber.
- Mosquito British light bomber, also used as night fighter.
- MPQ-2 Improved version of SCR-584 radar, originally designed to direct antiaircraft fire but also used to direct aircraft in close support bombing.
- M/T Motor transport.
- Pathfinder An aircraft which locates and in some manner marks a target so that succeeding planes may attack it.
- PPI Plan Position Indicator, a cathode ray tube on which a map of the surrounding terrain was superimposed so that it might be used in directing night fighter interceptions.
- RAAF Royal Australian Air Force.
- RAF British Royal Air Force.
- RCM Electronic radar jamming device.
- RO Radar Observer, operator of the AI radar in a night fighter.
- R/T Radio telephone.





Scramble To take off from the ground in an attempt to intercept an enemy aircraft. ✓

SCR/270 Early warning radar. ✓

SCR/540 Early type of AI radar ✓

SCR/584 Radar set originally designed to direct antiaircraft fire, but also used to direct aircraft in close support bombing. ✓

SCR/717 ASV search radar. ✓

SCR/720 AI radar set used in P-61 night fighter ✓

SCR/729 Airborne IFF ✓

Shoran Short range electronic navigation device, also used for accurate blind bombing. ✓

~~S/L Searchlight.~~

~~SOP Standard operating procedure.~~

~~Superfortress Name given to B-29 Bomber.~~

Synchronous bombing Bombing in which the dropping angle is determined by synchronizing the travel of the bombsight optics with the ground speed of the bombing aircraft. ✓

~~Tetrahedron Device scattered along roads to puncture tires.~~

Tracer Type of ammunition which burns in flight and thus makes its trajectory visible. ✓

Vector A navigation problem in which either wind direction and velocity, true heading and true airspeed, or true course and ground speed may be determined if the other factors are known. Also, a heading given to an aircraft by a ground controller, or the act of giving such a heading.

VHF Very high frequency radio communications equipment.

~~VOCO Vocal order of the commanding officer.~~

V/T Proximity fuse.

Window Metallized strips of paper used to jam radar stations.





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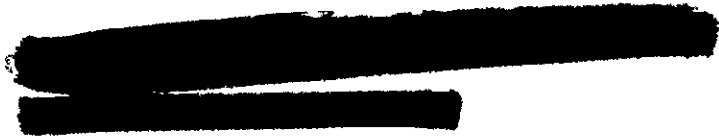
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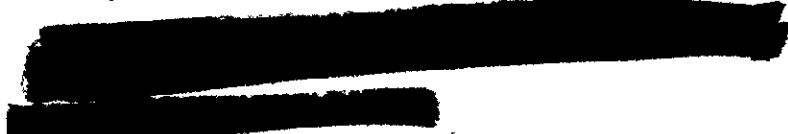
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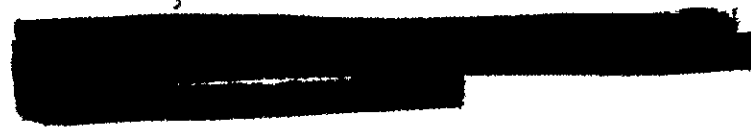


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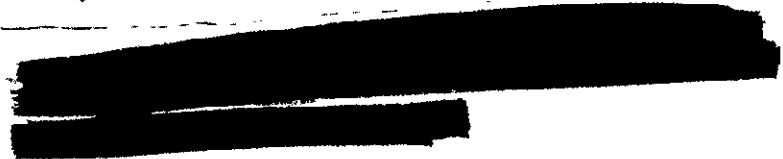
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