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THE PLOESTI MISSION OF 1 AUGUST 1943

Prepared by
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R E F E R E N C E H I S T O R Y

THE PLOESTI MISSION

1 AUGUST 1943

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The original of this monograph and the documents from which it was written are in the USAF Historical Division, Archives Branch, Bldg. 914, Maxwell Air Force Base, Alabama.

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June 1944

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F O R E W O R D

This "first narrative" has been prepared by the Historical Division, AC/AS, Intelligence as a contribution to the history of the Army Air Forces in the current war. Available records of the Ploesti Mission of 1 August 1943 were complete enough to suggest the advantages of setting forth in one monographic study the full story of both the planning and the execution of an outstanding mission of the Army Air Forces. It is felt that its exposition of the staff work at Headquarters, Army Air Forces and in the theater will provide a useful supplement to the operational record itself.

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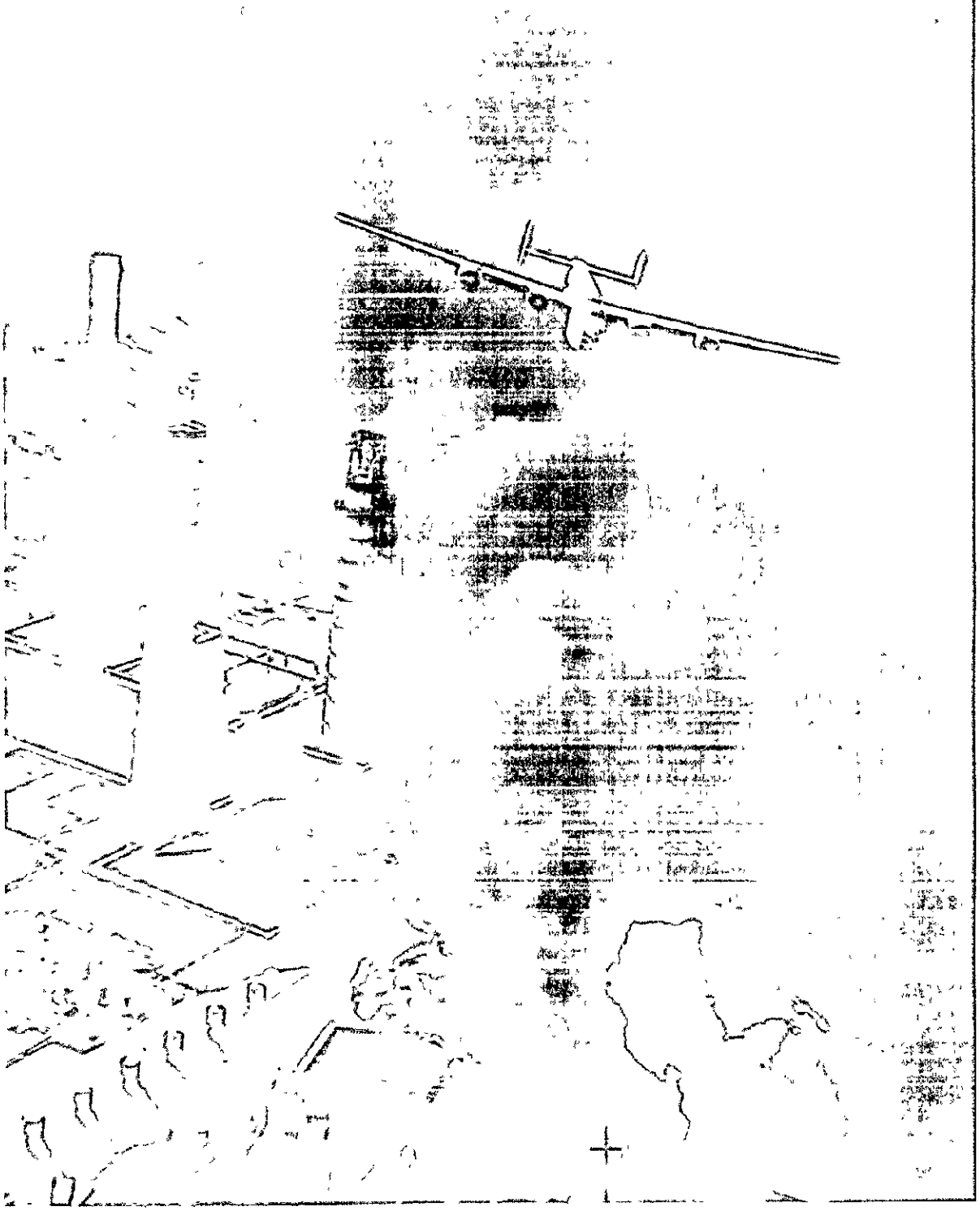

Liberator over Ploesti

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"...we know that the primary function of bombardment is to destroy vital enemy facilities, factories, etc., which are making it possible for him to continue to fight against us. We know that the selection of the most vital targets must come as a result of thorough analysis. We know that the strength of our striking force will always be relatively limited. We must, therefore, apply it to those specially selected and vital targets which will give the greatest return. We cannot afford to apply it where, or in such manner that, the return is not eminently worth the cost. We know that there is room for doubt as to whether friend or enemy is worn down faster by bombing unless it is applied with precision against vital objectives..."—

Gen. H. H. Arnold to Lt. Gen. Carl Spaatz and Maj. Gen. Ira C. Eaker, 10 April 1943

CHAPTER I

INTRODUCTION

The Ploesti mission of 1 August 1943 stands out as one of the major exploits of the United States Army Air Forces in World War II. Not only is it an epic of American valor; it was record making. It was the first large-scale minimum-altitude attack by heavy bombers upon a heavily defended target. It was the longest large-scale bombing mission that had been undertaken to that time. It was, moreover, a masterpiece of detailed and careful planning, training, and briefing. Measured in terms of injury to enemy war potential, even though it fell short of the expectations of its planners, the mission was, again, significant.

Four industries were considered especially vital to Germany's ability to wage war. They were aircraft production, ball bearings, rubber, and oil. In modern industry as well as in modern warfare no other item is more essential than oil, and none, therefore, a more proper objective of strategic bombing operations. No other oil target was as tempting as the Rumanian refineries centered around Ploesti. In fact, few targets in all Europe appeared to offer so rare an opportunity for striking at the vitals of the enemy.

Contrary to the predictions of many, Nazi Germany by August 1943 was rounding out its fourth year of war, not only without having collapsed because of insufficiency of oil, but without having

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manifested undue distress on that account. Bare oil statistics which revealed a ratio of more than nine to one in favor of the United Nations were entirely misleading, for logistical considerations tended to equalize the situation. Moreover, the Nazis before as well as after the outbreak of hostilities gave the crucial matter of oil supply their special attention. A bold stockpiling policy was adopted, civilian motor traffic was all but eliminated, tractor and truck engines were equipped to consume solid fuels, and facilities for producing synthetic fuel from coal were greatly expanded. In allied and conquered countries additional stores and refineries were at their disposal.[1]

Nevertheless, the belief persisted in allied countries that the Nazi supply of liquid fuels and lubricants was scanty and a cause of grave concern. This view seemed to be confirmed by the two great German drives of 1942, one into the Caucasus, the other into the Middle East—both in the direction of oil. During the brief period in which the Germans held the Soviet Maikop oil fields, every effort was made to exploit them.[2] Because of the demands created by the Mediterranean operations it was evidently intended that Maikop should take the place of Ploesti in supplying the south Russian front. This plan was thwarted, however, by the successful Russian counter-offensive. The German forces involved in the Russian campaign were very numerous, their lines of communication were overextended, and they were largely dependent upon motor

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transport for supply. Under these circumstances the Axis oil situation must certainly have become worse. Indeed, after the failure of their drives in the fall of 1942, the Axis powers, appearing to lack the strength for another major attack, went over to the defensive, adopting a course of contraction.

Absolutely reliable statistics on Axis Europe's oil production and consumption were, of course, lacking. It was said that Germany could use 30,000,000 metric tons of oil, but could still function on half that amount. Actually, annual production estimates during the earlier half of 1943 range from 13,750,000 to 16,300,000 tons.[3] Of the two available sources of fuel oil, natural and synthetic, it is not certain which by mid-year contributed the greater quantity. Synthetic oil was produced from coal by two processes: the Bergius hydrogenation, yielding gasoline of high quality; and the Fischer-Tropsch, resulting in good oil and gas, but inferior gasoline. Methods of synthetic production were being constantly improved and the quantity of output was increasing. The principal synthetic oil plants in Germany were located at Bruex, Blechhammer, Leuna, and Poelitz. Natural oil was derived principally from Rumania, smaller amounts originating in Austria, Hungary, Poland and Germany. Estimates of the contribution of the Rumanian refineries to western Axis supply of all petroleum products (high octane aviation fuel, ordinary gasoline for motor transport, Diesel oil and lubricating oil) vary from 27% to 35%. Roughly speaking, therefore, it may be

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said that Hitler drew a third part of his total supply of liquid fuels from Rumania. It was from the Ploesti refineries that he procured ready oil for the Russian front. Here, also, was refined much of the high grade fuel and lubricants required by the German Luftwaffe. The destruction of the Rumanian refineries would not only upset the oil economy of Axis Europe, but would necessitate the transportation of crude oil hundreds of miles for refining to Italy, southern France, or southern Germany, thence to the Eastern Front, thus placing an additional burden upon the already strained transportation facilities of the Axis. The position of the enemy would thus be rendered much more difficult.

Rumania during the last decade preceding 1941 ranked fifth among the world's producers of crude oil, surpassed only by the United States, Soviet Russia, Venezuela, and Iraq. Production in the peak year (1936), however, amounted to only a little more than 3½% of the world's total output. While the production capacity of the Rumanian refineries in 1941 stood at 10,719,000 tons, the crude oil actually processed probably did not greatly exceed 5,000,000 tons.[4] At least three-fifths of this amount was taken by the Axis powers.[5] The surplus refining capacity was skimming, not cracking capacity, much of which was to be found in relatively small, obsolete, scattered plants, often not located near producing fields or main pipe lines or railway exporting points.[6]

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Rumanian government to restrict the operations of great foreign companies and to encourage small indigenous concerns to rise, the industry remained a pawn in the great game of international politics. After the Nazi occupation of Czechoslovakia in 1939, the British and French governments hastened to give Rumania guarantees of military support, but German pressure proved stronger, and a large share of Rumania's exportable oil moved up the Danube to Germany. The fall of France and Russia's demand upon Rumania for retrocession of Bessarabia brought a complete reorientation of Rumanian policy. A new Fascist government appealed to Hitler for support against the U. S. S. R. He made his guarantee of protection conditional upon the immediate German occupation of military points in the country and the expulsion of all British oilmen. Speedy execution of a Rumanian order for the apprehension of all British nationals foiled the schemes that the British had developed for the destruction of the wells and installations, and the Rumanian oil industry passed intact to German control.[11]

Once in military possession of the country the Nazis established a more effective control over Rumanian economy and set up the Gestapo in the leading cities. A series of defensive measures were soon adopted to insure absolute secrecy on the defenses of Ploesti. The city, for example, was partially evacuated of its nonessential civilian population. A German oil company (the Kontinentale) was formed, the shares of which were owned by German industrialists and

The crude oil of Rumania came from more than 20 oil fields confined to an area approximately 60 miles long and ten miles wide. All the important ones, yielding approximately 95% of Rumania's production, lay within a radius of 30 miles northeast and west of the city of Ploesti.[7] In some places the number of wells averaged as low as one to every 10 acres; elsewhere as high as eight or 10 to every 10 acres. They were for the most part of modern construction. The bulk of crude oil was piped from field storage tanks to various large refineries, a smaller amount being shipped to the refineries by railway tank car. Neither the oil wells themselves nor the storage tanks were considered profitable targets for aerial bombardment. The truly vital oil targets were the dozen or so refineries, easy to locate and highly inflammable, concentrated at Ploesti, producing approximately 85% of Rumania's refined petroleum products and accounting for about 95% of the total cracking capacity.[8]

The industrial district of Ploesti, most important in Rumania, occupied an area of approximately 19 square miles and had an estimated population of 100,000. It was situated in the Wallachian plain on the small Dambul River, a tributary of the Teleajen, some 35 miles north of the capital city of Bucharest. Directly northward rose the foothills of the Transylvanian Alps. Rail and highway routes converged there from all directions. While various industries were represented, oil refining eclipsed all others in importance, and

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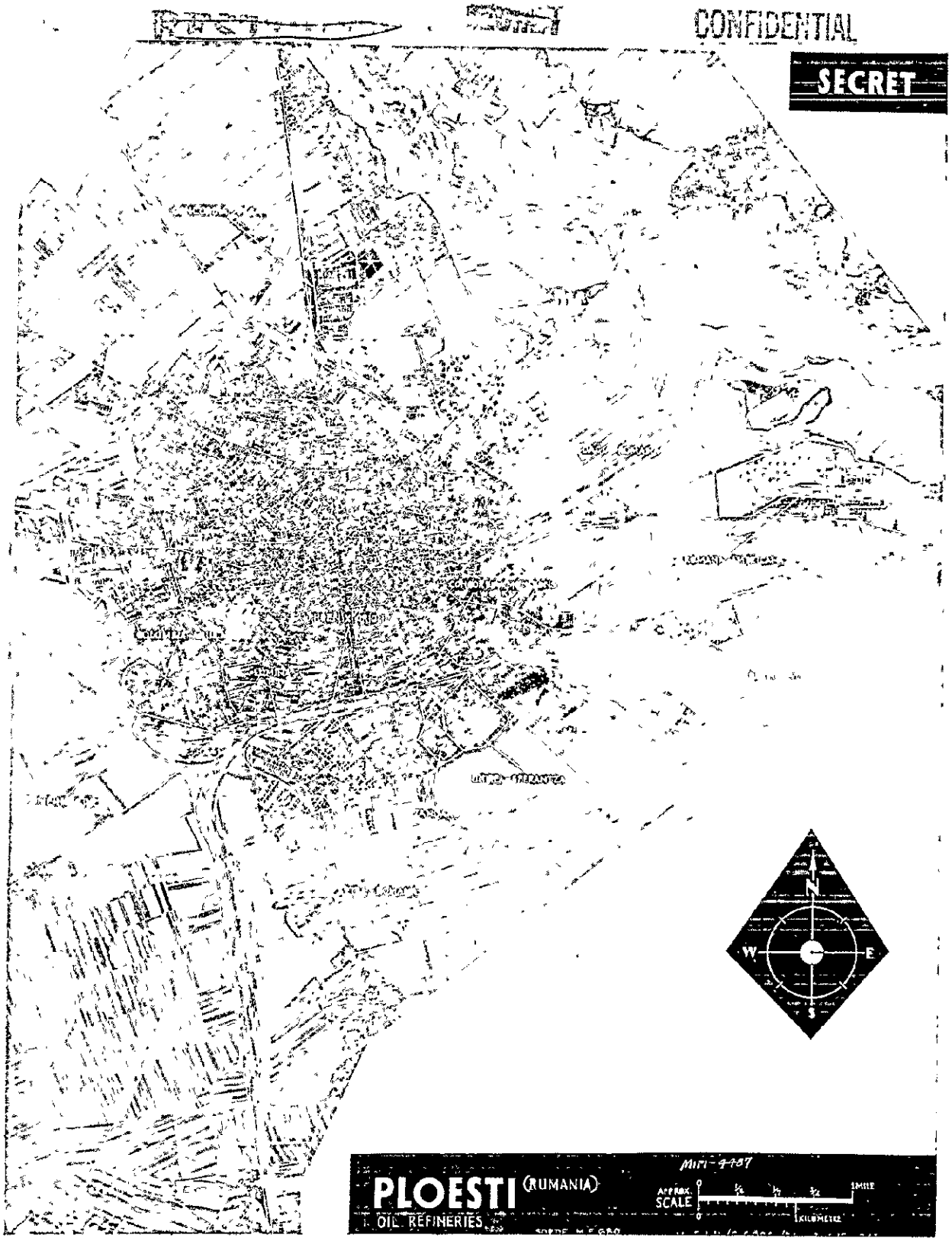

Mosaic of Ploesti Target Area Made from Pictures Taken on Reconnaissance Mission of 3 August 1943, Showing All Refineries Attacked Except the Steaua Romana Located at Campina

endowed Ploesti with its characteristic appearance, a panorama of high-chimneyed refineries, tank farms, and rail network. Of the 14 leading refineries of the country, 10 were located at Ploesti itself, one five miles to the south in the small town of Brazi, and another 20 miles northwest in Campina. Concentrated in the area also were practically all the technical personnel and skilled labor essential to the industry.

The following is a list of the leading refineries together with statistics of production capacity and quantity of crude oil processed during the earlier half of 1941 (the latest figures published):[9]

Refinery	Production Capacity	Crude Oil Processed (1st half 1941)
Astra Romana	2,000,000 M.T.	567,065 M.T.
Concordia Vega	1,470,000 "	341,698 "
Romana Americana	1,400,000 "	333,676 "
Unirea Orion	720,000 "	184,299 "
Unirea Speranta	441,000 "	52,852 "
Colombia Aquila	540,000 "	140,254 "
Petrol Block Standard	504,000 "	208,298 "
Steaua Romana (Campina)	1,240,000 "	203,930 "
Creditul Minier (Brazi)	540,000 "	164,650 "
Total	8,855,000 "	2,196,722 "
Annual Estimate		[4,393,444 "]
Rumania's Total	10,719,000 "	2,413,876 "
Total Annual Estimate		[4,827,752 "]

The Astra Romana refinery, largest of the Rumanian refineries and originally controlled by Shell interests (British and Dutch capital), had modern cracking units which produced fuel ranging as high as 87 octane aviation gasoline. The Giurgiu pumping station lay within the area of this target, as well as an important railway

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junction and marshalling yards. It was the most southerly located of the Ploesti refineries.[10]

The Concordia Vega, lying north of the city and formerly controlled by French and Belgian interests, was the only Rumanian refinery possessing cracking equipment capable of producing lubricating oil of the highest grade. Within its confines were situated pumping installations which distributed all the crude oil coming in from the field to the other refineries.

American capital formerly controlled the Romana Americana, third most important of the refineries, which was situated three miles east of Ploesti. Its machinery was among the most modern in Europe. Besides its cracking plants, it contained two important boiler pumps and the power plant for the Constanta pumping station.

British-controlled Unirea Orion, situated on the southern edge of Ploesti, although small, contained modern cracking units and possessed a plant which produced the bulk of the lubricating oil originating in the district.

Unirea Speranta, likewise once British owned, had an important cracking plant. It was situated east of the main freight yards in southeast Ploesti adjoining Standard Petrol Block installations. Modern cracking installations and a lubricating oil plant were the principal targets of the latter which was formerly an American-controlled refinery.

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Lying southwest of the city was the American-British built, but French-operated, Colombia Aquila refinery. It was notable for producing a high proportion of the total benzine output of the country. Its cracking installations and boiler house presented a very compact target.

Steaua Romana, located at neighboring Campina, was one of the largest and most modern refineries in Rumania. In addition to its large cracking installations it had the only important paraffin plant found there.

In nearby Brazi was situated the highly modern Creditul Minier refinery equipped with large cracking units, the only plant capable of producing 100 octane gasoline, the best aviation fuel.

Rumanian petroleum products could be of use to the Axis, of course, only if effectively transported from the Ploesti area. Approximately 85% of Rumania's oil exports had gone by way of the Black Sea port of Constanta, 10% via the Danube River, and the remaining 5% over three railway lines leading from Rumania into Central Europe. The war, however, brought about a radical change in this situation by greatly reducing the usefulness of Constanta as a port of exportation. Giurgiu, a Danubian port lying approximately 80 miles southeast of Ploesti, became the most important oil transshipment point in Europe.

Although four or more pipe lines moved a considerable amount of petroleum from the Ploesti region to Giurgiu, perhaps four times as

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much moved by rail. All the major refineries were equipped with extensive loading sidings at which oil trains were made up for dispatch over double-tracked railways to Giurgiu, where the oil was transferred to barges for shipment to upper Danubian ports for further distribution throughout Axis Europe. Pipe lines ran from Campina to Ploesti, thence southward to Giurgiu and eastward to the vast depots of Constanta. The flow to Giurgiu contributed to the vital traffic on the Danube, which was heaviest during the months of March through December, particularly just after the spring thaw and beginning at mid-August when Rumanian grain joined oil in the movement northward. The limited amount of petroleum reaching Constanta was shipped by tanker to southern Russia. Pumping stations were situated at the various oil centers, and those at Ploesti, closely connected with the refineries, constituted targets of unusual importance. Oil was shipped overland by three rail routes radiating from Ploesti to the north, northwest, and west. Especially significant to the Nazis was the line running northward through Cernauti and Kolomyja to Lwow, for it was the main shipping route to the Russian front. The northwest line extended to Vienna and Berlin, the west line toward Italy. Railway bridges along these lines afforded valuable targets for strategic bombardment.

Foreign capital had been primarily instrumental in the founding and development of Rumania's oil industry. Its strategic significance was such that, despite efforts after 1936 of the strongly nationalistic

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the German government. It rapidly took over one after another of the expropriated foreign refineries.[12] The Germans also established effective control over all rail traffic in and out of Rumania and all long-distance movements on the Danube.[13] National restrictions on foreign interests over the past several years had resulted in a declining oil production, and everything possible was done to force up this production and to create transportation facilities necessary to place Rumanian oil at the speedy disposal of the Axis. There were limits, however, to what could be accomplished. The policy of the Rumanian government was to retain control as far as possible in the national interest, and the Nazis showed reluctance to adopt measures that would transform an ally into a foe.

For a time London maintained a semblance of correct relations with Bucharest, but when finally the British government in February 1941 severed its tenuous diplomatic relations with occupied Rumania the Balkans teemed with rumors of impending RAF attacks.[14] The first bombardment, however, was made by Russia. The Axis attack on the U. S. S. R. came on 22 June 1941, and starting on 25 June a series of three daily raids was carried out on Rumanian targets.[15]

While the principal objective of these early attacks was the Black Sea port of Constanta, Bucharest and Ploesti also received some attention. The bombing, carried out at night, was largely ineffectual, only slight damage resulting to oil installations.[16] Much more effective was the raid of 14 July, a surprise attack

delivered at 1800 hours by six Soviet airplanes flying at an altitude of from 2,000 to 3,000 feet.[17] Damage, amounting to more than a million dollars, was done to refinery equipment at the Unirea Orion plant at Ploesti. Eighteen tanks were destroyed, together with their contents. The refinery itself was put out of production for about four months. More than a year later, in September 1942, Soviet bombers once again attacked Bucharest and Ploesti, but this time with very little success.[18]

It remained for the Americans to undertake the most notable attempt to destroy the Rumanian oil industry. Within a month of Pearl Harbor, Col. Bonner F. Fellers, able and alert U. S. military attache at Cairo, pointed out that German operations could be curtailed if deprived of Rumanian oil, that this objective lay within reach of Allied long-range bombers, and recommended that the matter be taken up by War Plans Division for consideration.[19] About the same time Harry L. Hopkins, presidential adviser, inquired of Lt. Gen. H. H. Arnold, head of the Army Air Forces, as to the feasibility of bombing the Rumanian oil fields and asked for a statement of theoretical approaches to the accomplishment of that end.[20] No U. S. air force had as yet been sent to the Middle East and the gist of the reply sent to Hopkins was that while the B-24 type aircraft could attack as far as Budapest from bases in the United Kingdom, penetration of German defenses en route would probably result in a prohibitive cost in losses.[21]

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Among the earlier undertakings of A-2 was a study of The Danube as an objective for Air Attack. Data were gathered on the oil industry of Rumania, as well as on rail and water communications between the Balkans and Germany. On the basis of this material the Operational Plans Division of the Air Staff prepared a study, employing the same title.[22] This, together with supporting materials, was submitted to WPD, which pronounced it "sound tactically and strategically." The weakness of the USAAF and commitments or plans for other theaters, however, precluded action on the plan at that time, and it was filed away for use when the situation warranted it.[23]

The matter had arisen meanwhile in another way. Early in April, Military Intelligence cabled to the Middle East for detailed information concerning the Balkans, especially the Rumanian oil refineries, rail communications between these and the Ukraine, and vulnerable points in rail and water communications throughout the whole area.[24] In his reply, Colonel Fellers declared Rumanian oil to be "by far the most decisive objective," "the strategic target of the war," and within striking distance by heavy bombers. The installations were grouped in small vulnerable areas about Ploesti. In his opinion the destruction of Constanta and rail and oil pipe lines from Ploesti to that port would paralyze the flow of fuel to the German front. However, these objectives could be reached only so long as the Middle East was secure. To insure this, he urged the

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sending without delay of an American task force and the carrying out of bomber attacks against decisive objectives. This he regarded as the most effective American contribution to the war against Germany possible in 1942, and one which could be carried out at the least cost. Air Chief Marshal Sir. Arthur W. Tedder was reported as being anxious for the assistance of an American air force, especially heavy bombers, to be used against Rumanian oil, and willing to supply the necessary gasoline, oil, and bombs.[25]

The means of implementing these proposals was provided by the Halverson Project (Halpro). This project called for the creation of a squadron detachment equipped with 24 B-24's under the command of Col. Harry A. Halverson. When mobilized and trained, it was to be ordered for special duty to the Far Eastern theater of operations, or on such other combat mission as might be determined by OPD.[26] The Fellers cablegram of April had been referred to General Arnold, and passed on by him to OPD for study. In collaboration with A-2, this division submitted a second comprehensive study bearing the title Strategic Targets within Range of Middle East Air Bases. In this study the Ploesti oil refineries and lines of communication were indicated as the most remunerative targets for Allied air attacks offering the promise of maximum aid to the U. S. S. R. in its struggle for survival.[27] Of special significance was the recommendation that in the event Halpro could not reach its intended

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destination that force should be employed from the Middle East on a Rumanian oil mission.[28]

The prospective loss of Burma to the Japanese at this time made it extremely doubtful, in fact, that the Halpro objective in the East could be achieved; therefore, it was recommended that Ploesti be substituted, a move regarded as likely to lead to a decisive contribution to the defense of the Soviet Union.[29] Accordingly, the Halverson Detachment was ordered to proceed on its mission as far as Khartoum, and there to await further instructions.[30] Its training had emphasized highly specialized maximum-range group operations. British authorities were requested to provide base facilities and security forces for advance airdromes and to cooperate in the work of preliminary planning.[31]

Inasmuch as the desire to render effective assistance to the Soviets was uppermost in the minds of the planners of the raid, the War and State departments felt justified in soliciting the cooperation of the Soviet government to the extent of permitting the use of landing fields in the Caucasus-Ukraine area following the attack on the objective. The possibility of a return trip raid from Soviet bases was also suggested.[32] Use of the Soviet airdromes would greatly shorten the flight and, therefore, reduce the hazards of the mission. Negotiations to this end were not completed in time for the raid which came on 12 June 1942.[33]

At the time of the arrival of the Halverson Detachment in the Middle East the military situation there was critical. The British Eighth Army under the sharp thrusts of Rommel was rapidly retreating toward the Nile Delta, and plans were being made for the evacuation of Egypt. The arrival of this first U. S. air combat unit, small though it was, could not have been other than an encouraging development, enthusiastically hailed.

Thirteen airplanes of the Halverson Squadron departed for Ploesti from Fayid (Canal Field), Egypt, between 2230 and 2300 hours, 11 June, instructed to proceed individually to the target, attack at high level, and then continue, if possible, to an airdrome near Ramadi, Iraq.[34] The flight, 2,600 miles, is one of the longest on record for a combat force. On the way out the weather was unlimited, but at the objective there was broken overcast at 10,000 to 12,000 feet which practically obscured the targets. All 13 planes reached the objective. The attack, which was a surprise, was made at dawn. A majority of the aircraft bombed from below the clouds. About 10 bombed the Astra Romana Refinery at Ploesti; one, the port of Constanta; and the remaining one or two attacked unidentified targets. The attacking force encountered a few fighter craft, fairly heavy anti-aircraft artillery, and a balloon barrage. At least one ME-109 was destroyed. The results of the bombardment were unobserved. According to an unconfirmed report picked up by naval intelligence an oil depot at Ploesti was destroyed, one bomb fell in the woods,

another hit a railway station, while several fell on Constanta without doing much damage.[35] At any rate, the damage inflicted fell far short of expectations. On the other hand no American flier was killed or wounded and no airplane was brought down by enemy action. Four aircraft including that of Colonel Halverson (after about 12 hours in the air) made the terminus; three others reached other points in Iraq, one crashing and another sustaining slight injury on landing; two arrived at Aleppo, Syria; and four were forced down, two of them damaged, in neutral Turkey, these being interned with their crews totaling 37 men.[36]

After carrying out his raid against Rumanian oil objectives and after seven of his B-24's had participated in a damaging attack upon an Italian naval force off Taranto, Colonel Halverson asked to be allowed to continue on his way to the Far East, without further delay, to carry out his original mission.[37] Because, however, of the unfavorable situation in the Far East and the desperate state of affairs in Egypt, he was ordered to assemble his command near Cairo, report to Gen. Russell L. Maxwell, commander of U. S. forces in that theater, and to employ his force in cooperation with the RAF in its Middle Eastern operations.[38] It was not, however, the intention of the War Department that Halpro airplanes should be employed in local tactical operations unsuited to the technical characteristics and accepted tactical use of heavy bombardment aircraft. The Halverson Squadron, therefore, remained in Egypt, soon joining with the 9th

Bombardment Squadron to form the "Provisional Bombardment Group," which ultimately became the 376th Bombardment Group.

The failure of the Halverson raid was due to various causes. The bad weather conditions encountered over the objective were an unforeseen handicap. The crews had little or no experience in long-range combat operations. The force sent on the mission was much too small to accomplish the results expected of it.[39] But even though it must be considered a failure in so far as its immediate objective was concerned, experience gained through it was of considerable importance in the planning and carrying out of the greater attack of 1 August 1943.[40] Intelligence materials collected on the former occasion were readily available for the latter. The earlier raid indicated definite difficulties, knowledge of which guided action to overcome them. The Halverson raid underlined the absolute necessity of undertaking this operation with a very much larger force. Also, it indicated the need of approaching and attacking the target in the daylight hours rather than in hours of darkness and dusk. The difficult problem of navigation was even more evident. Moreover, certain of the participants of the first mission were assigned to units that took part in the later attack, and the planners of the latter profited from their firsthand knowledge. Finally, it should be said that the Halverson raid "proved beyond the shadow of a doubt that American trained crews and equipment are

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capable, even under very difficult conditions, of flying long distances to reach an air objective with accuracy."[41]

Marshal Rommel's sweep toward the Nile Delta was halted in early July 1942, at a point barely 70 miles from Alexandria. For nearly three months thereafter the situation continued stalemated, the issue resting in the balance. In the latter part of October a well-prepared Allied offensive was launched against the El Alamein line, and the Axis forces began the 1400-mile retreat which was to end in unconditional surrender in the Tunis-Bizerte area early in May 1943. So long as the outcome remained undecided all available forces were needed in direct operations against the enemy in North Africa and the Mediterranean, and the project for destroying the Rumanian oil installations remained in abeyance.

Meanwhile, however, the significance of Rumanian oil to the Axis war effort was never lost sight of. British and American intelligence agencies were constantly collecting data on the capacity and production of the refineries, their defenses, and other information which might be of value in operations against them. The Combined Chiefs of Staff from time to time took up the matter for consideration, and at one time ground action was proposed for the purpose of procuring air bases from which attacks might more conveniently be made.[42] It lay within the logic of history that sooner or later further assaults would be made. Down to July of 1943 strategic bombing of key Axis industries was on a relatively limited scale and for the most part sporadic in character. Thereafter, Allied attacks, steadily increasing in intensity and concentration, became more systematic. In view of this new trend, sources of Axis oil supply could not remain long unscathed.

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CHAPTER II

THE PLANNING OF THE MISSION

About mid-April 1943, Brig. Gen. T. J. Hanley, Deputy Chief of Air Staff, communicated to the OPD of the AAF General Arnold's desire that the project to destroy the Rumanian oil industry be revived.[1] It was suggested that it might be better to act before Axis power was completely expelled from Africa. A surprise might be gained by early action; later, the enemy was more likely to be on guard and to possess greater power of resistance. Plans, asked to study the matter and to submit a recommendation, presented a study setting forth the possibilities for disruption, in line with U. S. strategic bombardment policy, of the enemy's economic and military strength by striking at various targets in the Danubian basin, including Ploesti.[2] This was followed within a few days by a second memorandum prepared by Lt. Col. C. V. Whitney.[3]

Upon being assigned as Assistant Air Intelligence Officer of the Ninth Air Force in the Middle East in June of 1942, Colonel Whitney had undertaken a study of the place of Rumanian oil in Axis war economy, and, convinced of its vital importance, evolved a plan for the destruction of the Rumanian refineries, drawing upon information from all intelligence sources available in the Middle East.[4] His plan, known as Project R, was submitted to General Brereton in January 1943. Designed to fit the capabilities of the Mediterranean

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Theater at that time, the original Whitney plan was on a somewhat limited scale, calling for the employment of a minimum force of 48 heavy bombers. A fixed number of airplanes was assigned to each of the targets, which included six essential refineries and a marshalling yard. A daylight attack was to be launched from bases near Aleppo, in northern Syria, across neutral Turkey.

The forces available to the Ninth Air Force, however, had been insufficient to execute the proposed mission and at the same time comply with its primary responsibility of supporting the British Eighth Army when Whitney was transferred to Washington. Interest at Headquarters led to securing a copy of his plan, which, revised in light of new information, constituted the second memorandum.[5] The revised Whitney plan envisaged the destruction of key oil installations, which, if realized, would result in the early dislocation of the Axis war effort, especially in southern Russia. While alternate routes were considered, northern Syria was preferred as the base of operations. A striking force of at least 100 heavy bombers was suggested as necessary to do the job.

Meanwhile the destruction of the Rumanian oil industry was being considered in other quarters. In March 1943, Col. Jacob E. Smart, young and able member of General Arnold's Advisory Council, originated a plan for a minimum-altitude, mass attack upon the oil refineries from the Bengasi area.[6] The proposed attack, to be carried out by approximately 200 B-24's upon nine carefully selected refineries, was

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to be made after the completion of the Tunisian campaign and prior to the invasion of Sicily.

The idea of minimum-altitude bombing advocated by Colonel Smart was not new. What was unique in the Smart plan was its advocacy of the use of heavy bombardment type aircraft in a minimum-altitude mass attack. Normally, such an operation would call for the employment of A-20's or fighter-bombers. This unorthodox employment of air power was recognized as being extremely hazardous, and was likely to result in heavy losses. Nevertheless, it was felt that the decisive results expected, because of the greater accuracy of low-level bombing of pin-point targets, would justify these losses, and that a single such attack might in the long run be even more economical than numerous attacks at high altitude. The nine refineries selected for attack presented very small targets. It was estimated that approximately 2,400 sorties at high altitude would be required to obtain even partial destruction of each refinery. Given a force the size of the one available, it would take two months to carry out this number of sorties.[8] Each succeeding mission would find the target area more heavily and expertly defended and the advantage derived from strategic surprise entirely lost. Moreover, such a prolonged campaign against Ploesti would mean the practical loss of a very large striking force against other targets.

At General Arnold's direction Colonel Smart lost no time in elaborating his plans.[9] Intelligence material was collected from

every available source, the greater part coming from the Target Branch of Operational Intelligence, Headquarters, AAF. This information was supplemented by personal interviews with individuals who had intimate first-hand knowledge of the Rumanian oil industry. An unusual feature of the Ploesti Mission was that its plan of execution was worked out in considerable detail at Headquarters in Washington. Various officers at Headquarters, well versed in matters of intelligence and the employment of heavy bombardment aircraft, worked with Colonel Smart in preparing detailed plans for the carrying out of the operation. Especially notable in this connection was the work of Col. C. G. Williamson of A-2 and Lt. Col. J. B. Montgomery of Bombardment. Major Walter J. Wagner of the Air Corps Proving Ground at Eglin Field, Fla., an outstanding proponent of low-altitude bombing, also participated in the preliminary planning.

With two carefully developed plans before him, General Arnold was ready for prompt action when the question of undertaking an attack on Ploesti was raised by the Combined Chiefs of Staff about the middle of May. Although the two plans shared various features, they contained two principal differences. The Whitney plan designated northern Syria as the base of operations and assumed that the attack would be made at high altitude. The Smart plan, on the other hand, favored Libya as a base and minimum-altitude attack.

In the spring of 1943, Germany, despite the defeat at Stalingrad and the subsequent prolonged retreat of the succeeding months, was expected to launch a third great drive on the Russian front.

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Meanwhile, the western allies of the Soviet Union, having effected a successful landing in northwest Africa, were about to expel Axis power completely from that continent. Until this was done, however, they were in no position to aid the U. S. S. R. by undertaking an invasion of Western Europe. A principal means by which they might hope immediately to cripple the Nazi war machine and thereby relieve the pressure on the Soviets was to strike at the Ploesti oil supply.

In a meeting held on 13 May, the Combined Chiefs of Staff agreed that the possibilities of launching a decisive air attack on Ploesti should be explored by the Combined Staff Planners and that a study of the subject should be submitted "as a matter of emergency."[10] Three days later the Joint War Plans Committee submitted to the Joint Chiefs of Staff for consideration a report by the Advisory Council entitled Air Attack on Ploesti.[11] Admitting the feasibility of the project, the report recommended that the Combined Chiefs of Staff agree to an attack on Ploesti during June or early in July and that they direct the Commanding General of the North African Air Forces to prepare detailed plans and execute the mission, and that the Commanding General of the AAF be designated as the executive agency for implementing this decision.[12]

When the matter next came up for consideration before the Combined Chiefs of Staff, General McNarney, stressing the importance of its timing in particular reference to the German commitment on the Russian front, expressed the view that a successful attack on the refineries would be the greatest single aid that could be

rendered the Russians in 1943.[13] It was agreed that the Commanding General of the United States AAF should send representatives at once to present the plan to Gen. Dwight D. Eisenhower, Commander in Chief of the North African Theater, who should be asked to submit appropriate comments and recommendations to the Combined Chiefs of Staff.

The Ploesti project was laid before the Anglo-American Trident Conference, at that time in session in Washington.[14] From the discussion it appeared that the execution of the plan would require two B-24 groups to be taken from the United Kingdom for a period of about four weeks and the diversion of a third B-24 group en route to Britain, delaying its arrival there by about two weeks. Air Marshal Sir Charles Portal, British Chief of Air Staff, observed that there were two major considerations in deciding whether the project should be undertaken: one, whether aircraft should be diverted from the pre-HUSKY [that is, Sicilian] operations, concerning which the British Chiefs were in doubt; and, two, fear that a partially successful operation would render more difficult further attacks from more suitable bases which might subsequently be acquired. In the opinion of Gen. George C. Marshall, U. S. Army Chief of Staff, the attack, even if fairly successful, would be a staggering blow to the enemy; indeed, probably the greatest that could then be struck.

On 24 May, less than a week after the submission of the project to the Combined Chiefs of Staff, Colonel Smart, acting as direct

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representative of the Commanding General of the AAF, presented the matter to General Eisenhower, who was quick to appreciate the advantages offered.[15] Both he and Air Chief Marshal Tedder were eager to undertake the mission. General Eisenhower's only concern was the loss of sorties at a most critical stage in the Sicilian operations. The loss, however, resulting from the diversion of two B-24 groups to the Ploesti mission might be partially compensated for by moving to North Africa, as soon as practicable, the two B-24 groups from the United Kingdom and the 389th Bombardment Group scheduled for movement from the United States to Great Britain. General Eisenhower agreed to forward his recommendations upon completion of his investigation of the effects of the operation upon HUSKY and the logistic capabilities of airdromes in the Libyan area. Finally, on 3 June, "after consideration of all known factors," he definitely recommended implementation of the project and indicated that it would probably be carried out sometime in July.[16] He requested that the 389th Bombardment Group be sent to North Africa as soon as possible. It could finish its training there by participating in the HUSKY operations.

Two days later, after study of the project by his air staff and conferences at Algiers with Gen. George C. Marshall and Gen. Sir Alan Francis Brooke, British Chief of Imperial General Staff, General Eisenhower cabled the Combined Chiefs of Staff his conclusion that SOAPSUDS was an "important and desirable operation."[17] He recommended that it be undertaken at the earliest possible moment when it would

not interfere with HUSKY and sufficient time could be allowed for training and preparation.[18] He further recommended that the three additional groups of B-24's to be sent to the Middle East especially for the Ploesti Mission should be sent there as soon as possible for training and that during this period they should be available for use in the Sicilian operations. He was of the opinion that it might be possible to undertake the project at the end of July with a total of five heavy bombardment groups.

The Combined Chiefs of Staff, meeting on 8 June,[19] agreed that the necessary air forces should be assembled in North Africa as soon as possible and that General Eisenhower should carry out the SOAPSUDS operation "at the earliest practicable date provided it does not on any account prejudice HUSKY or risk failure through inadequate time for preparation."[20]

As late as 20 July, after the necessary air power had been assembled in the Middle East and played its role in the HUSKY operations, and only 12 days before the Ploesti mission was to be carried out, the question of abandoning it was under consideration.[21] General Eisenhower agreed with Generals Marshall and Arnold, however, that it would be a mistake to call it off, since preparations were already well advanced, and the project was permitted to go forward.

Throughout the planning of the Ploesti mission, aid to the Soviet Union was a primary consideration. The idea persisted, therefore, that cooperation might properly be expected in that

quarter. Within less than a week after the final adoption of SOAPSUDS project by CCS, General Marshall submitted a memorandum to the Joint Chiefs of Staff on "Operations of Red Air Force Subsequent to 'Soapsuds'."[22] This memorandum suggested that, assuming the SOAPSUDS operation would be successful, continued efforts to insure destruction and hinder repair of the damage should be made. If, following the execution of SOAPSUDS, the situation on the Eastern Front were favorable, it would be of great assistance to the Allies if the Red Air Force were to follow up this operation at some propitious time by striking the same objective with force. It appeared desirable, therefore, that at the proper time the President and the Prime Minister should jointly request Premier Stalin to employ the Red Air Force in this way. In approving the recommendation contained in the memorandum the Joint Chiefs of Staff agreed that the effectiveness of SOAPSUDS would be considerably increased if it could be followed up in the way suggested.[23] At the same time, General Marshall indicated that there was no particular hurry about taking the action recommended. On the same day the matter was laid before the Combined Chiefs of Staff.[24] Their reaction to the proposal was virtually the same as that of the Joint Chiefs of Staff; however, the additional point was made that coordinated attacks on Ploesti by the air forces of the United States and the Soviet Union would indicate close unity of operations and have a desired psychological effect.

Since the SOAPSUDS project was to be carried out from his theater, General Brereton, Commander of the Ninth United States Air Force, was charged with conducting the operations.[25] The general planning phase over, detailed planning remained to be done, chiefly abroad, in Great Britain and the Middle East. In this work various military agencies, British as well as American, made significant contributions.

After successfully presenting the SOAPSUDS project to General Eisenhower at Algiers, Colonel Smart, still acting as the direct representative of General Arnold, proceeded to Great Britain. During his three weeks' stay there, in June, he conferred with the Commanding Generals of the European Theater and of the Eighth Air Force to determine the maximum number of heavy bombers that could be obtained from that theater for the Ploesti operation.[26] Arrangements were made for the borrowing of the Eighth Air Force's Liberator-equipped bombardment groups and for building this force up to full strength or above by replacement crews and aircraft from the United States. These groups were at once set to work practicing zero-altitude mass bombing. They thereby proved by actual demonstration that this type of attack was entirely feasible. In fact it was shown that it was possible for a large number of aircraft to attack very small target areas with even greater facility than had been imagined.[27]

In Maj. G. K. Geerlings, the Eighth Air Force supplied for the promotion of the undertaking a specialist, the excellence of whose

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work contributed greatly to the chances of success. He was primarily instrumental in the preparation of briefing material, navigational aids, target folders, and intelligence data. Material was procured from every available source, the Air Ministry, the Admiralty Library, Oxford, etc.

One of the chief aids rendered by the RAF was the construction of scale models. One of these represented the area bounded by the Transylvanian Alps on the north, the Danube on the south, the easternmost oil fields in the Ploesti area on the east, and the Iron Gate of the Danube on the west; another, on a larger scale, the terrain surrounding Ploesti, Brazi, and Campina; and still larger ones, each vital refinery. These models, produced by the RAF Station Medmenham, were of almost unbelievable accuracy and excellence, although turned out in only one week. The target map sheets, originating from the same source, were also of great usefulness. Air position indicators for 18 planes to assist in navigation to and from the target and personnel to assist in their installation and to instruct American crews in their operation and maintenance were provided by the British.[28] About three weeks were spent by British and American personnel, working together, in preparing a briefing movie which presented in a period of about three-quarters of an hour intelligence material collected over a period of months.[29] General Brereton, charged with conducting the operations against the Rumanian refineries, appointed those officers of his command most familiar with the project as planning and operational members of his

Advanced Headquarters Staff.[30] These officers were directed to prepare detailed plans for executing the Ploesti Mission both at high and low levels, estimating the degree of success and the losses that might be expected, and setting forth the advantages and disadvantages of each type of attack. In general, they were to supply him with all available data that would be useful in helping him decide the type of attack that was to be made.

On 25 July, the very day of Colonel Smart's arrival in the Middle East, the first meeting of the Planning Committee was held.[31] Eight officers were present, including Brig. Gen. U. G. Ent, commander of the IX Bomber Command, under whose immediate direction the SOAPSUDS operation was to be carried out; Col. Claire Stroh, head of the Operation Section of General Brereton's staff; Col. Edward J. Timberlake, commander of the 201st Wing (including the three heavy bombardment groups diverted from the Eighth Air Force); Col. Raymond T. Lester, weather officer of the Ninth Air Force, and Colonel Smart. The Committee approved Colonel Smart's selection of vital targets. Lengthy consideration was given various aspects of the HUSKY project, that is, the invasion of Sicily, as it affected SOAPSUDS. It was estimated that five missions would be required of each group in connection with HUSKY, as a result of which approximately 10 aircraft might be lost, thus leaving about 190 for SOAPSUDS, in case replacements were not received in the meantime. Given a 10-day period between HUSKY and SOAPSUDS, at least 80% of the available aircraft should be operational for the initial Ploesti mission. The estimated

loss of aircraft in one low-level attack in the SOAPSUDS operation was placed at 16 for each group, whereas the losses for 10 missions at high level were set at 12. As to whether the attack should be made at high or low altitude, it was felt that there was insufficient data available on which to make a decision. A study was in progress, however, the results of which would be made known within a few days. Colonel Lester, weather officer of the Ninth Air Force, was instructed to submit a weather estimate for the period beginning the latter part of July and the Intelligence Section of the Planning Staff was asked to verify existing intelligence data and to secure as much additional information as possible, especially concerning the defenses of the target area. The desirability of photo reconnaissance prior to the operation would require command decision. Colonel Timberlake was instructed to prepare a training program; while Colonel Smart was directed to prepare a plan of operations.

Before the preparations for TIDAL WAVE (i.e., SOAPSUDS) could go forward two basic decisions had to be reached. Should the Ploesti attack be based on northern Syria or Libya? Should it be carried out at high or low altitude? Both decisions were the ultimate responsibility of General Brereton.

The question concerning the base of operations was decided at the very outset of the detailed planning stage. While various bases had been suggested from time to time, the choice really lay between Aleppo and Bengasi. The former location was nearer the objective

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and virtually the whole route from base to target was over land. Nevertheless, the advantages of a North African base more than offset these considerations and resulted in the selection of the Bengasi area.[32] A relatively minor factor was the desire to avoid the creation of a diplomatic problem by flying over neutral Turkey to make the attack. Much more important was the greater likelihood of achieving a surprise by flying across the Mediterranean and over one of the most inaccessible regions of the Balkan peninsula, thereby avoiding the more densely settled areas of Turkey and Bulgaria and enemy radar stations. A take-off from Aleppo by a force of 200 heavy bombers could be interpreted by enemy observers in but one way, because Ploesti was the only objective lying in the direction of flight warranting such an effort. However, the principal determinant was logistics. At that very time the Middle East was suffering from an acute shipping shortage, which would have made it difficult, if not impossible, to transport the necessary equipment and supplies to the more distant Syrian base. Two of the heavy bombardment groups to be employed in the operation were already based near Bengasi, and there were adequate facilities there for receiving the three groups yet to arrive. The five groups were all to operate under the IX Bomber Command. A factor that was bound to play a part in determining the method of attack was the type of bomber that was available for use. All five of the heavy bombardment groups slated for the operation were equipped with B-24D's, selected instead of B-17's because they

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alone were capable of flying the requisite distance with a sufficient load of fuel and bombs successfully to perform the mission.

The B-24 had played an outstanding role in the battle of the Atlantic in extremely long-range operations from the United States to Britain and was fully tested in combat operations in the Aleutians, the South and Central Pacific, Middle East, North Africa and over Nazi Europe. Well equipped with fire power, it had a reputation for being able to get along without fighter escort. Moreover, it could take a tremendous amount of punishment from both ack-ack and enemy fighter aircraft. General Brereton, calling the B-24 "a magnificent hunk of bomber," declared that Liberators "return so badly shot up at times that their return is due only to the courage and skill of our pilots."[33] Undoubtedly one of the best heavy bombers in the world, the Liberator was an airplane of very distinctive appearance, with its unusually long thin, tapering, high mid-wings, the stubby slab-sided fuselage and very high, oval twin fins. Although on the ground appearing huge and ungainly, high in the air it soared with an easy grace matched by few other aircraft. Flying low, its bulky, awkward appearance predominated, and this, together with its roar and speed of approach, transformed it into a terrifying monster. Despite its many fine qualities, however, the Liberator was not suited for low-altitude operations. Colonel Smart, himself, has stated: "Of all the world's aircraft there is probably none less suited to ground strafing than the B-24. It is relatively slow . . . it is clumsy and doesn't react to controls, and to the man on the

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ground it appears that it can be knocked down with a rock."[34] Nevertheless, tests made by the Eighth United States Air Force in England had proved the feasibility of zero-altitude mass attacks by B-24's.

It was the responsibility of General Ent to consider and to recommend the type of attack that was to be made. After referring the matter to the Operations Analysis Section of his command for scientific study,[35] on 30 June he communicated his personal views on the matter to General Brereton.[36] As regards high-level attack, General Ent stated the opinion that definitely 50% of the target could be destroyed in four missions and there was a better than 50% chance that still greater damage could be done in even fewer missions. Four missions could be flown in nine days with 80% maintenance efficiency if the necessary engines were forthcoming. The estimated total loss of airplanes was placed at the moderate figure of 22. The morale of the crews, he believed, would be better at higher altitude than at low, and the chance of failure to locate the target and failure because of smoke screen would be minimized. The very simplicity of the plan of attack would increase its chance of success. The need of a preliminary training period would be eliminated. On the other hand the greatest advantages to be derived from low-level attack, as he viewed it, were the speedy accomplishment of the objective and the chance of total destruction offered. However, he evidently did not consider this chance very

great, for he commented, "I have no basis for assuming it, but cannot help feel that 50% destruction is the best that can be hoped for." The time element, he felt, might be about the same in either type of attack, for he believed that a low-level attack would require a fortnight of training. Moreover, he was of the opinion that there would be difficulty in picking out pinpoint targets and that a smoke screen might well result in an abortive mission. Finally, he estimated the loss of aircraft in low-level attack at 75. "Having read the above," he concluded, "you have no doubt guessed my recommendation, which is: 'To attack at High Level until the target is destroyed or satisfactorily neutralized'." Colonels Smart and Timberlake and Group Captain Lewis were sent to General Brereton with a paper containing the results of the investigation.

Included in the data submitted to General Brereton was a comparison of the two plans, developed point by point, in parallel columns. The high-altitude plan proposed hitting nine aiming points, one in each refinery, with two 500-pound bombs and obtaining the required destruction of other vital objectives by incidental damage. On the other hand, the low-altitude plan was designed to hit 27 selected pinpoint targets in the nine refineries with 141 1000-pound bombs. In the former case, about 2,400 initiated sorties were considered necessary to put a sufficient number of airplanes over the target to insure something like a 90% probability of obtaining two hits on each of the nine aiming points. In the latter case, 200 initiated sorties were considered necessary to put a sufficient number of aircraft over the target to insure a better than even chance of destroying all key objectives.

It was estimated that high-altitude bombing might require as many as 20 missions over a period of two or three months at an estimated loss of 170 aircraft. On the other hand, if 15 days were allowed for training, single low-altitude attack with the available force of approximately 200 airplanes had a better than 50% chance of destroying virtually all key objectives within 16 days at an estimated loss of 71 aircraft.[37] It was possible that the low-altitude attack might lead to disaster for a large part of the attacking force, with slight damage to the target, in which case there would probably not be a sufficient force left with which to make an attack of any sort with any chance of success. The whole situation was summed up briefly, as follows: "If it is granted that the successful destruction of the target would warrant the possible expenditure of the entire force, then the time element and its effect on the war would appear to be a deciding factor in favor of the low altitude attack."[38]

General Brereton, after considering the arguments pro and con, decided that TIDAL WAVE could best be accomplished by a single zero altitude attack, followed by as many other attacks as might be required to achieve the desired degree of destruction.[39] These subsequent attacks were to be made at either low or high altitude, depending on experience gained in the first attack. Despite the fact that his own recommendation was rejected, General Ent, once the decision was made, gave it his complete support.[40]

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During this period of basic decisions Colonel Smart produced a revised plan of operations for a low-level attack which was to serve as the general basis for subsequent planning.[41] The aim of TIDAL WAVE, as defined, was to render the nine major Ploesti refineries virtually useless for at least four months. The low-level method of attack proposed called for the selection of the most vital installations of these refineries as targets. Seventeen distillation and nine cracking units were singled out for destruction. It was computed that 75 airplanes could carry a sufficient bomb load to insure the destruction of these targets; yet, in order to compensate for errors and for aircraft which turned back, it was proposed to double this force. Hence, the minimum force that should undertake the low-level attack was placed at 150 airplanes. If participation in the HUSKY operation ceased a week to 10 days prior to the mounting of TIDAL WAVE, an 80% serviceability of available aircraft might be expected. Thus, in order to make sure of having the requisite number of operational aircraft for the mission, 188 would have to be assigned to the five groups on D-day. It was estimated, on the basis of the number of aircraft then in sight, that as many as 31 might be lost in the Sicilian operations without TIDAL WAVE suffering. Any increase in the size of the striking force was considered desirable. The forces striking at certain key installations might well be augmented by at least 16 airplanes. To insure the availability of a force of 166, allowing for 80% serviceability, 200 aircraft would need to be assigned on D-day. In this case only

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19 losses could be spared in support of HUSKY. According to estimates, 200 aircraft would be available for TIDAL WAVE 10 days after release from HUSKY.

In order to contribute to the success of the undertaking the Special Staff of Advanced Headquarters was considerably augmented by the addition of specialists in training and indoctrination, low-altitude operations, intelligence, communications, armor and armament, materiel, weather, construction, draftmanship, etc.,[42] and duties were assigned in accordance with the special abilities of these officers.[43] Four were designated members of the Advanced Headquarters Staff: Colonel Smart; Colonel Stroh, General Brereton's A-3; Colonel Timberlake;[44] and G/C D. G. Lewis, RAF fighter operations expert. This group constituted the separate Planning and Operational Staff, which was to meet daily at 0830 hours to discuss development and make preparations for TIDAL WAVE.[45] The whole set-up functioned under the general supervision of the Advanced Headquarters Staff.

The success of the Ploesti mission was dependent to a very great extent upon surprise. Hence, extraordinary measures to insure secrecy had to be adopted, especially since conditions in this respect were notoriously bad in the Middle East.[46] A portable green shack was set up in the compound of Advanced Headquarters near Bengasi. In the earlier part of July, three B-24's arrived from England bringing with them a mysterious cargo. Thereafter the little structure was forbidden ground to all but a select few who

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appeared for meals at all hours and worked far into the night.[47] In charge were Colonels Smart and Timberlake. Constant visitors included General Ent; Col. R. Sanders, his chief of staff; and Lt. Col. P. S. Zuckerman, charged with intelligence and security matters connected with the project. The security measures adopted appear to have been successful, many officers about Advanced Headquarters remaining unaware of the objective of the mission until after the attack was actually under way.[48]

Having made the basic decisions necessary for the TIDAL WAVE operation, the planners took up the work of elaboration. Targets and target forces were among the first matters to claim their attention.

In general, the geographical situation of Ploesti with its surrounding mountains, rivers, and plains made it easily distinguishable from the air. Moreover, the refineries of the region with their rambling structures and high chimneys were easily identified and afforded the bombardier excellent distinguishing areas for sighting. Months before the final stage of planning it was recognized that nine refineries were of major importance and that the destruction of a limited number of key installations in each of these refineries would render them virtually useless. Distilling units, which were very vulnerable, were marked for destruction because in them the initial refining process took place. Cracking plants also stood high on the target lists, for they produced from

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TABLE I. TARGETS AND TARGET FORCES PLANS*

Target	Refinery	No. of Key Instls.	Order of Export.	A/c Alltd.	Place in Form.	Flight Plan over Target	Group Assgd.	Commander and Leader
White I	Romana Americana	6	3	24	1	4 waves of 6 a/c	376th	Col. Compton Lt. Flavelle
White II	Concordia Vega	6	2	21	2	3 waves of 6 a/c 1 wave of 3 a/c	93d	Lt. Col. Baker Maj. Brown
White III	Standard Petrol Block Unirea Sperante	3	5	12	3	4 waves of 3 a/c	93d	Lt. Col. Baker Maj. Potts
White IV	Astra Romana Unirea Orion	10	1	40	4	4 waves of 10 a/c	98th	Col. Kane Capt. Young
White V	Colombia Aquila	6 (3)	7	15	5	5 waves of 3 a/c	44th	Col. Johnson Maj. Brandon
Blue	Creditul Minier (Brazi)	3	6	18	6	3 waves of 6 a/c	44th	Lt. Col. Posey Capt. Diehl
Red	Steaua Romana (Campina)	7	4	24	7	8 waves of 3 a/c	389th	Col. Wood Capt. Caldwell

* The Ploesti Mission was planned on the basis of 154 aircraft participating. Actually, 177 successfully took off. The 23 spares appear to have been distributed among the seven target forces, as follows: White I, 4; White II, 4; White III, 0; White IV, 6; White V, 2; Blue, 2; and Red, 5.

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crude oil the higher grades of fuels and lubricants; moreover, they were specially constructed in each case and, consequently, more difficult to replace. Boiler houses, essential in the refining process, had special significance inasmuch as most refineries fought fire with steam and their destruction would, therefore, reduce fire-fighting facilities. The number of such key installations selected varied from time to time in the planning, in the end totaling more than 40. These specific targets were grouped together to constitute seven general targets. Five of these, embracing seven of the major refineries of Ploesti, were designated White I, White II, White III, White IV, and White V. The Creditul Minier refinery at nearby Brazi was Blue Target and the Steaua Romana, at Campina, Red.[49]

In all 154 airplanes were allotted to targets, roughly according to importance and number of key installations. Each airplane had a specific target. Various considerations entered into the assignment of specific groups to targets.[50] For instance, according to the flight plan worked out, the force assigned to Red Target would be the last in the formation. The 389th Group, because of its relative lack of experience and being equipped with planes with belly turrets which gave them different flying characteristics, would find it difficult to fly a close formation with the other groups. It, therefore, was assigned to the Campina Target. The isolation of this target called for an individual effort and the time of attack did not have to coincide exactly with the main attack.

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This group could train as a unit and fly as a unit. Since the force assigned to White I would be the leading group of the formation, it was felt that the most experienced group should be assigned this position. The 376th, the original heavy bombardment group of the Middle Eastern Theater, was assigned this place. Targets White I, II and III, having in common a definite landmark leading to the center of the targets, formed a natural division. The forces assigned to Targets White II and III would fly the same formation as the 376th, directly behind it, which would aid in keeping a close formation at the beginning of the route column. Since the 93d Group had two excellent leaders to be assigned as force commanders and leaders, who could be under the supervision of the group commander, these two targets were assigned to the 93d, a veteran group from the United Kingdom. The cooperation existing between the 376th and 93d, it was believed, would contribute greatly to the success of the mission. Targets White IV and V and Blue constituted the third and final division of the target area. The 98th and 44th Groups were assigned to them, the last two going to the latter. Since these groups occupied the same landing ground this arrangement would simplify the training and briefing problem.

Group commanders were selected as commanders of the target forces, as follows: Col. Keith K. Compton (White I); Lt. Col. Addison E. Baker (White II and III); Col. John R. Kane (White IV); Col. Leon W. Johnson (White V); and Col. Jack W. Wood (Red). Blue

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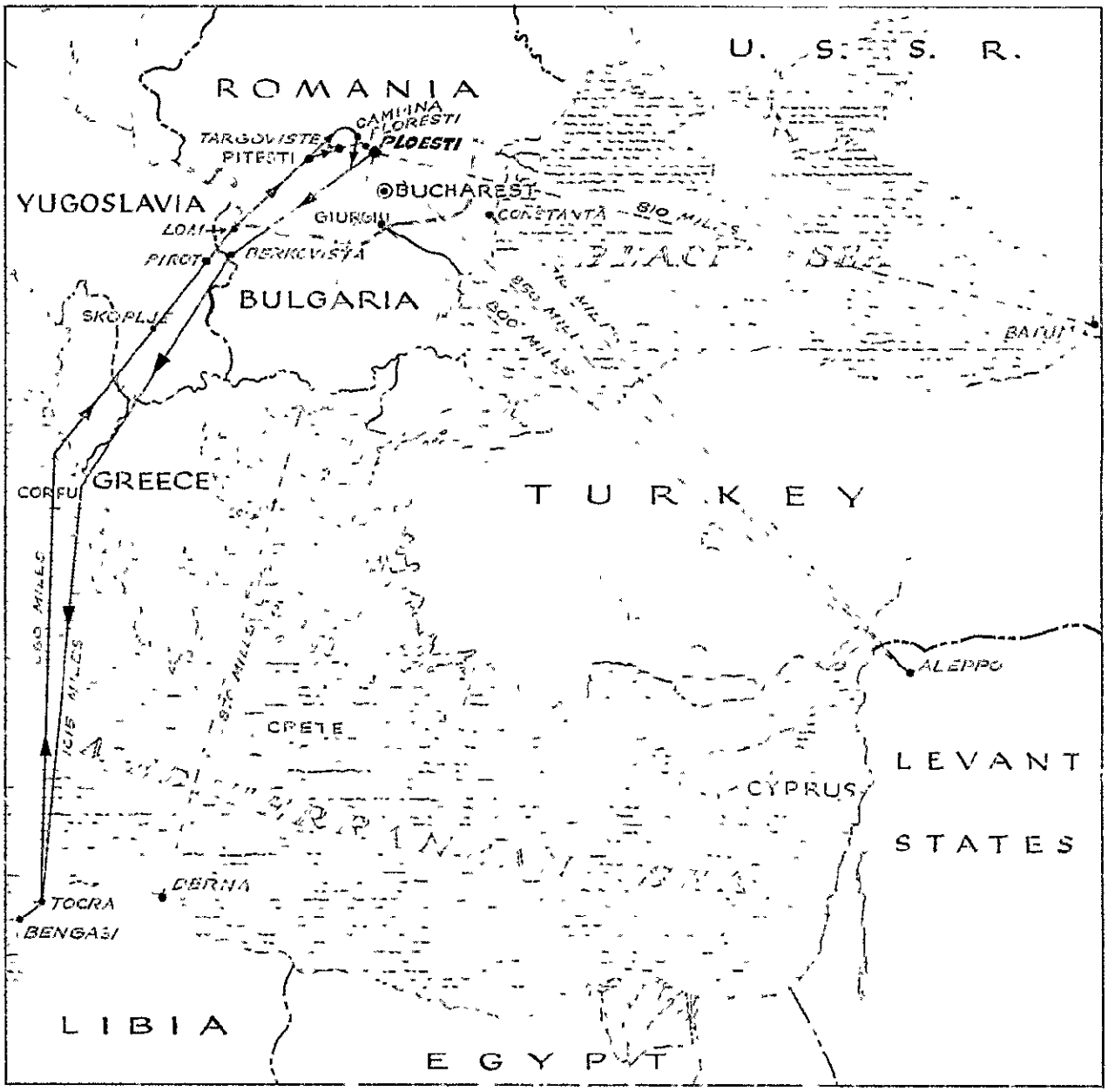
APPROXIMATE ROUTE OF FLIGHT
— PLOESTI MISSION —

1 AUG. 1944



LEGEND

⟵ PLANNED ROUTE

--- ALTERNATE ROUTES

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~~SECURITY INFORMATION~~

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Target received as its commander, Lt. Col. J. T. Posey.[51] In general, target force commanders were consulted in regard to the choice of target force leaders, and were permitted to select their flight leaders. The selection of leaders was made with the utmost care only after consideration of every known factor, the principal one being demonstrated ability for leadership.

The flight plan for the Ploesti mission underwent numerous changes before the final one was approved.[52] According to this plan the five bombardment groups constituting the mission force were to take off individually, assembling on the Bengasi-Driana-Tocra line at about 0730 hours on the morning of 1 August. By 0830 hours all were to be on course in visual contact with one another. This contact was to be preserved until Pitesti, Rumania, was reached. The groups constituting the first three White Target Forces were to lead, followed by those forming White IV and V and Blue, with the group assigned to Red Target bringing up the rear. The route formation plan adopted was varied, permitting maximum freedom of action with a minimum of horizontal dispersion. The 376th Group, leading, and two squadrons of the 93d were to fly single-space, stagger formation; two squadrons of the 93d and three of the 98th, V-formation; one squadron of 98th and all four of the 44th echelon formation, and the 389th, V-formation.[53] The rate of speed was to be 190 to 210 miles an hour.

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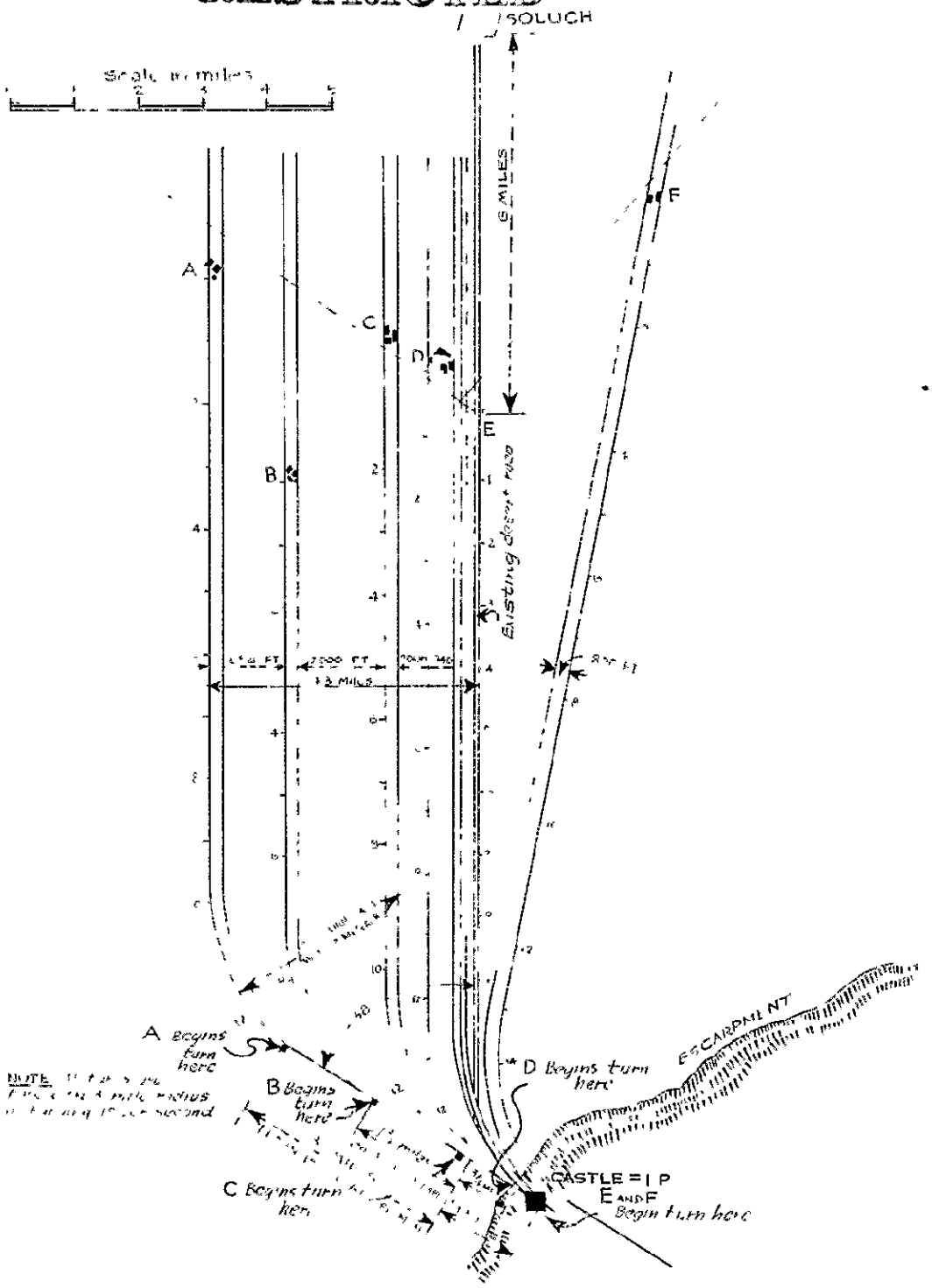
DIAGRAM OF DUAMAY TARGET



[illegible] on the located on the escarpment near the bottom of [illegible] recognize the [illegible] of the II (Florence). The [illegible] trail, desert road leading from near this point [illegible] make the straight railway line running [illegible] of Tocra. Towards this I [illegible] are indicated by the letters A and F, respectively.

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The course was designed to avoid, so far as possible, RDF and antiaircraft installations along the coast of Greece, thereby insuring surprise. From Bengazi the formation was to fly northward across the Mediterranean at an altitude of 2,000 to 4,000 feet, to a point approximately 125 miles south of Corfu (38°20'N-20°08'E). No radar installation was believed to exist on Corfu, but there were spotters and powerful radio stations on the island which could report the passage of the force in case it were detected. By flying high, around the island, not only would this danger be avoided, but also the course would lie beyond the radar coverage of stations located on the heel of the Italian boot. Slightly north and west of Corfu the aircraft were to swing northeastward across the mountains of Albania and Yugoslavia in the direction of a point near Lom (43°50'N-23°43'E) on the Danube. The 10,000-foot altitude was to be maintained until Pirot was reached. There the formation was to begin descending, so as to cross the Danube at 3,000 to 5,000 feet, remaining at this altitude until reaching Pitesti which lies about 58 miles from Ploesti. This level was below the tops of the mountains on which radar stations were believed to be located and at the same time was sufficiently high for accurate navigation.

At Pitesti the formation was to separate into two elements; the smaller consisting of 389th Group, or Red Target Force, last in the formation, was to continue somewhat further in a northeasterly direction up into the Transylvania Alps to a point from which a

this distance was over enemy territory; 1,400 miles over the Mediterranean Sea.

Another group of problems that confronted the planners of the mission concerned bombs. What type of bombs should be employed? How many were necessary to insure the destruction of the targets? What type of tail delay fuses should be employed? What quantity of bombs should be carried? Moreover, bombing at minimum altitude required a different type of bombsight from high-altitude bombing and a change had to be made.

The selection of bombs for TIDAL WAVE was the subject of a special memorandum by the ordnance officer of the Ninth Air Force.[54] The conclusion of this report was that either the 500- or 1,000-pound bomb was suitable for the low-altitude attack planned against the Rumanian oil installations. While the results of the two types would be comparable, a slight preference was indicated for the heavier bomb because of possibly greater effectiveness when exploding in the open. A second report made by the ordnance officer of the IX Bomber Command dealt with the matter of the use of tail delay fuse M-124 for low-level bombing with the 1,000-pound demolition bomb.[55] His conclusions were that, while this type of fuse was designed for use with the 500-pound bomb, tests with the 1,000-pound bomb showed that it could be used with it also at an altitude as low as 50 feet. The planners eventually decided to employ both the 1,000-pound and the 500-pound bombs; the former with tail delay

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targets. Flying was to be in close formation, wave following close upon preceding wave and wing tip to wing tip.

Subsequent to the attack the four White Target Forces were to continue at the lowest possible level on their attack course for varying periods of time after crossing the east-west railway line running along the southern border of Ploesti: White Forces I, II, and III, for two minutes and 15 seconds; White IV, two minutes; and White V, one minute and 45 seconds. This done, they were to turn right to a heading of 233° and proceed at an altitude of from 3,000 to 5,000 feet to Lake Balta Potelel, approximately 120 miles to the south of Ploesti. Both Blue and Red Forces were to turn right, also, just as soon as possible after leaving their targets, the former adopting a heading of 233°, and the latter one of 220°; both were to hug the ground at first, then climb to 3,000 to 5,000 feet and proceed to the rendezvous at Lake Balta Potelel. There the seven target forces were to resume route formation and start their climb to 10,000 feet. From the lake the course lay in a south-westerly direction through Berkovista across the mountains to the southern tip of Crete. From Corfu to Tocra and on to their home bases the groups were simply to fly the most economical altitude.

Although the Ploesti target was located at a distance of approximately 980 miles from the home bases of the attacking aircraft in the Bengasi area, the route that was to be flown required a round trip distance of approximately 2,100 miles. Seven hundred miles of

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southeasterly turn was to be made, following a well-defined valley, and attack the refinery at Campina. The larger element, consisting of the remaining four groups, was to proceed in a somewhat more easterly direction to its initial point of Floresti about 13 miles northwest of Ploesti. From Pitesti to their respective IP's both elements were to fly at minimum altitude above the terrain, and from their IP's to the targets were to reduce their altitudes to bombing level, that is, from approximately 100 to 300 feet, depending principally upon chimney heights. At Floresti the main force of four groups was to abandon route formation for attack formation, forming for this purpose six target forces, each consisting of a fixed number of aircraft flying a predetermined course along a well-defined route which would carry each force directly over its appropriate target. Places were to be so carefully assigned in each element as to enable each airplane to attack the pinpoint target assigned to it. The accompanying diagram of the dummy target area laid out in the desert near Bengasi on exactly the same scale as the original target, with all relationships exactly reproduced, illustrates how this maneuver was to be executed. The attack in every case was to be made from a northwesterly direction; the White Target Forces following a heading of 127°; the Blue Force, a heading of 132°; and the Red, 150°. Each force was to continue under a single leader until the individual targets were sighted, then sub-leaders were to assume command of the airplane assigned to the destruction of these

TABLE II.

BOMB LOAD PLAN*

Target Force	No. A/c	Est. Bombs to Insure Destructn.	1000-lb. Dem. Bombs Tail Delay Fuse		500-lb. Dem. Bombs Tail Delay Fuse			Total Bombs	Incendiary Bombs	
			1-6 Hrs.	1 Hr.	1-6 Hrs.	1 Hr.	45 Sec.		Br.-Type	AA.-Type
White I	24	84	24	-	36	-	72	132	48 Boxes	-
White II	21	84	-	48	-	-	54	102	42 Boxes	-
White III	12	48	-	24	-	-	36	60	24 Boxes	-
White IV	40	180	-	120	-	-	60	180	80 Boxes	-
White V	15	80	-	36	-	-	36	72	60 Boxes	-
Blue	18	72	-	48	-	-	36	84	36 Boxes	-
Red	24	100	-	48	-	48	-	96	-	48 Clusters
Spares	23		-	-	-	-	92	92	-	92 Clusters
Totals	177	648	24	364	36	48	386	818	290 Boxes	140 Clusters
Total Lbs.			24,000	364,000	18,000	24,000	193,000			
Total Bomb Load Carried (Exclusive of Incendiaries)					623,000					

* The Ploesti Mission was planned on the basis of 154 participating aircraft. Actually, 177 successfully took off. Each of the 23 spares was to be loaded with four 500-lb. bombs with 45-second tail delay fuse and four clusters American-type incendiaries. The spares appear to have been distributed among the seven target forces, as follows: White I, 4; White II, 4; White III, 0; White IV, 6; White V, 2; Blue, 2; Red, 5.

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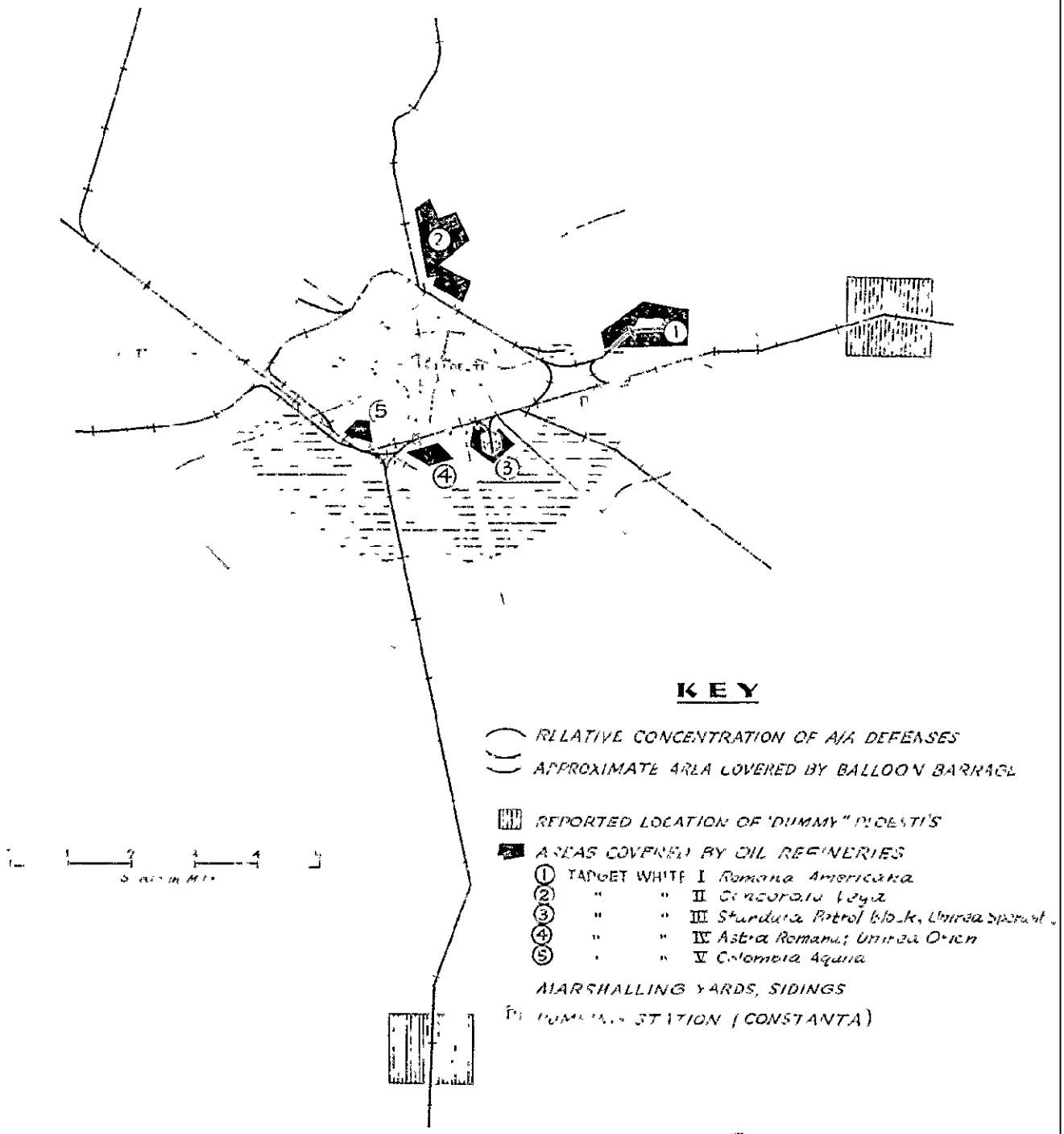
SUPPOSED DEFENSES OF PLOESTI AREA



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fuses of one to six hours and one hour, the latter with fuses of one to six hours, one hour and 45 seconds. In no case was the first or second wave of bombers that went over the target to carry bombs with the 45-second delay fuse. This would add to the safety of the operation for there would be no explosion until after the last wave had passed over the target. In order to insure maximum functioning, a supply of M-106 and M-124 fuses specially prepared in the United States was requisitioned and received by air shipment.[56] Because of the fact that fire could cause great damage in the oil refineries, it was decided that every airplane on the mission should carry a supply of incendiary bombs. Two types were to be employed, the four-pound British and the 100-pound American.

The normal bomb load of the B-24 is four bombs of 1,000 pounds or six of 500 pounds. The number of bombs that a target force was to carry was determined by an estimate of the number of bombs required to destroy its target, and the number required to insure destruction. The latter figure was two or three times as great as the former.[57] In all but two cases (Target Force White V and Target Force Red) the number of bombs allotted equalled or exceeded the number estimated to insure destruction. The addition, in the end, of 23 airplanes to the original 154 used as a basis for planning brought all target forces at least up to that level. A majority considerably surpassed it.

The special type of bombing operations envisaged for TIDAL WAVE necessitated the installation of a new type of bombsight, the N-7

low-altitude sight, with a B-24 mounting, as well as training in its use. USAAF officers were despatched early in June to do this work both in the case of the groups still in Great Britain and those in the Middle East.[58]

The estimated weight of a Liberator loaded with 3,100 gallons of gasoline, ammunition, and bomb load was approximately 65,000 pounds. The carrying of sufficient fuel to make the long trip to Ploesti and back was made possible by equipping each aircraft with two auxiliary bomb bay fuel tanks. Typical of the careful planning that lay back of the Ploesti Mission was the fuel consumption test made 10 days prior to D-day.[59] One plane was chosen from each of the five bomber groups to follow a flight plan similar to that designated for TIDAL WAVE. Each was loaded with full ammunition and bomb load and 3,100 gallons of gasoline. The average amount of fuel consumed was 2,230 gallons, and the average flight time was 11 hours and 12 minutes, making the average hourly consumption slightly more than 202 gallons.

The defenses of the Rumanian oil region would determine to a great degree the measure of success that would be attained by the mission and the extent of the losses suffered. To the various phases of this matter, therefore, most careful attention was given. The Germans, after their occupation of Rumania, had imposed a rigid regime of secrecy; and the attack had to be planned without recent detailed intelligence as to the exact strength and location of the defenses. The idea of sending advance reconnaissance missions over

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the target area was considered but in the end rejected because it was feared that this might constitute a warning of impending attack and eliminate the chance of a surprise. There was every reason to believe that an objective of such great strategic value to the Nazis, which had previously been attacked by both the Soviet and American Air Forces, would be strongly defended. The Nazis certainly gave every evidence of being extremely defense conscious. The Ploesti area appears to have been regarded by Rumanian fliers as the most heavily defended area in Europe.[60]

The outer antiaircraft defenses were believed to be strongest to the northwest, north, and northeast of the area and weakest to the southwest, south and southeast.[61] There were indications that the total of heavy and medium antiaircraft guns in the area numbered approximately 100. Probably the former were manned by Germans and the latter by Rumanians.[62] Light guns perhaps numbered several hundred. The inner defenses, extending for five miles in a belt around the town, were considered to be very strong. The oil fields were dotted with flak towers, and the refineries themselves encircled with antiaircraft guns.

The relative weakness of the antiaircraft defenses to the southwest, south and southeast were offset by the presence of a balloon barrage covering the approaches to the target. The balloons, estimated at less than one hundred, were believed to be anchored by cable to trucks, lowered by day and raised at night to an elevation

of 6,000 to 10,000 feet. The balloon barrage was given special study by the Operations Analysis Section of the IX Bomber Command and was the subject of a memorandum drawn up by Army balloon specialists.[63] From this it appeared that the German type of balloon was much smaller than the American or British and that the cable to which it was attached was weaker. So far as was known, the German balloon was not equipped with lethal devices of any sort. The Operations Analysis Section calculated that there was an 18% probability of impact for a B-24 flying through a balloon barrage of the type likely to be encountered. It would be advantageous for a plane encountering a balloon cable to attack it down wind and at as low an altitude as possible. British experience was cited to show that for planes of all types, 33% of those striking a balloon cable were casualties. Balloons had often proved ineffective in low-level attacks from the United Kingdom. They were never of sufficient density to prevent aircraft flying through them and time and time again they had cut the cables without serious damage to themselves.[64]

Prior to the German occupation of their country Rumanian authorities had undertaken the work of camouflaging the refineries and storage tanks. Because they followed conventional methods, however, their work was not very effective. After the Germans came in they were understood to have undertaken considerable camouflage operations.[65] An attempt was made to alter the appearance of the refineries by

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altering their vertical appearance. Heavy blast walls were thrown up around vital installations to protect them from damage from near misses. These camouflaged walls were generally double brick structures filled with cement. One was known to be about 23 feet tall and four feet thick at its base. The most important camouflage work undertaken by the Germans was believed to be the construction of a dummy town approximately ten miles east of Ploesti. This dummy town, complete as to details, was reported to be of papier-mache, and designed to deceive night raiders. According to reports, it was movable on short notice and there was a possibility that it had been moved to a position about the same distance south of Ploesti.

Rumania is the only Balkan country in which meteorological conditions permitted the employment of smoke screen and artificial fog in defense of military and industrial targets. It was assumed in the absence of definite information, that they constituted part of the defenses of Ploesti. The Operations Analysis Section in a memorandum on smoke screens set forth the available facts concerning the characteristics and use of crude oil smoke screens together with deductions.[66] Crude oil smoke was said to be least effective against vertical observation when the sky was clear and from 1100 to 1600 hours. It was estimated that a smoke screen produced by efficient pots with a wind of 10 miles per hour would not exceed 260 to 300 feet in height, at most.

Intelligence reported the existence of six airfields for the defense of the Ploesti area. There were additional ones in the

region of Bucharest that might be called upon to take part in case of emergency. However, there were no known enemy fighter airfields en route to the target from the point of departure until the Danube was crossed. The control of the fighter aircraft defenses had been taken over by the Germans, yet the Rumanians continued to play a role in this work.[67] The strength of the enemy fighter force stationed on these fields was not known for about a year. Close watch was kept on the current enemy order of battle in the eastern Mediterranean. The location and strength of enemy fighter aircraft two days before operations would determine the route of the mission homeward.

Radio direction finder (RDF) installations were believed to be located east of the Ploesti region to cover the approaches to the oil fields from that direction. Expert opinion held that it would be impossible for RDF installations to penetrate the western mountain approach as the mountains would serve to deflect the radio beams. The discovery of the location of enemy radar stations in the Balkan area on the very eve of the mounting of TIDAL WAVE in the main confirmed the ideas the planners had held concerning the matter.[68] There was no information at hand concerning the type of warning system employed by the enemy. Fully aware of the fire hazard in the refineries, the Nazis had installed an elaborate system of fire guards and fire prevention. A study of the enemy defenses left little doubt but that they were strong. However, it appeared that they were calculated to serve primarily against attacks delivered

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from the north and northeast. There was no indication that the enemy had made any special provision for low-level daylight attack from a west-northwest direction. The implementation of the TIDAL WAVE project is an outstanding example of the maximum utilization of intelligence in planning.

The hope for success in the undertaking was based to a great degree upon the effect of surprise on the Ploesti defenses. This is not to say that it was anticipated that the attacking force would actually appear over the target before an alarm was given. It was, of course, hoped that the warning of the approach might be postponed as long as possible, but it was assumed that the enemy would become aware of the approaching force as it crossed the Danube, that is, an hour's distance from the target.[69] Surprise, however, would be achieved if the enemy expected high-level attack and it were delivered at low-level, instead. All earlier attacks on Ploesti had been at high-altitude and all the information available to the enemy about Allied aircraft types would lead him to expect that sort of an attack. When the attack was made, heavy guns would be unable to direct accurate fire at the low-flying formations because of inability to follow a fast moving target. Hence, it was estimated that their efficiency would be nil. Light antiaircraft guns and machine guns would be able to fire, but not as accurately as at aircraft flying at levels between 3,000 and 8,000 feet. Moreover, they would have to contend with the smoke screen. If fighters were used at low level this would further hinder enemy fire because of the danger

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of shooting down their own aircraft. Fighters employed at low level would be at a disadvantage because they are less maneuverable at roof-top altitude. The fact that Ploesti had been left untouched for about a year was significant. The men on guard manning the guns or the fighter planes could not be expected to be as alert or efficient as in the case of a more active station. The morale effect on the defenses of a large formation of low-flying Liberators was still another factor to be considered. All in all, it was believed that the attacking force could reach and destroy its objective while the defenses were in a state of disorganization.

When the project of an attack upon the Ploesti oil industry was first laid before the Joint Chiefs of Staff in mid-May it was believed that it could be carried out before the end of June. Subsequently the mounting of TIDAL WAVE was made dependent upon HUSKY and the time of execution was of necessity postponed until the latter part of July. The timing of the attack depended upon various factors. The participation in HUSKY of the five heavy bomber groups assigned to TIDAL WAVE extended a week beyond the time originally estimated. Because of the time required for training this delay made it virtually impossible to launch the attack before the very end of July. On the other hand the Eighth Air Force was anxious to have its three groups back as soon as possible. The weather, of course, was a highly important factor in determining the time of the attack. A preliminary investigation made by the Weather Central of the IX

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Bomber Command indicated that weather conditions would be more auspicious for air operations in Rumania in August than in July.[70] A more detailed forecast for the period 15 July to 10 August was submitted by the Ninth Air Force weather officer about the middle of July.[71] It appeared from this that the period of 1-4 August was the best time for making the attack because it would just allow for the proper amount of training and was the earliest completely clear period indicated. The first day of August was Sunday, and it was believed that the defenses might be more off guard on that day than any other. The principal reason, however, for selecting 1 August was that Allied cryptographers had broken down the enemy cipher and were reading their weather reports. The cipher was changed at the opening of every month and it would require time to break down the newly adopted one. Meanwhile the Allies would be deprived of this advantage.[72] This was the date finally decided on. The time of day the attack was to be made also had to be considered.[73] Dusk and noon were the alternatives, since a night attack was ruled out. Noon was preferred because this would enable the whole flight to be made in daylight and all returning planes to come back to the home base. Smoke screens were likely to be less effective at noon than any other time of the day. Navigation to bases in Turkey and to bases in other countries, especially in the case of crippled airplanes, could be accomplished with less difficulty. The individual crew members, moreover, preferred a daylight return, which was a morale factor of some importance. The principal arguments in favor

of the dusk attack were that the airplanes could return home individually, rather than in formation for mutual protection, thus using less fuel, and with less fatigue for pilots. Once darkness had set in, since there was little danger from enemy fighters, the return could be made by the most direct route.

Although it was hoped that the Ploesti Mission might succeed in virtually annihilating its objective, the figure 90% sometimes being mentioned, even the most sanguine admitted that it could fall far short of that figure. From the beginning the possibility of follow-up attacks to complete the job were considered. It was generally felt that subsequent high-altitude missions should be carried out. The planners actually attempted to estimate the number of sorties and time that would be required to complete the task, assuming 50% destruction as a result of the first attack.[74] In their calculations, it is interesting to note that of the estimated 200 aircraft leaving home base, it was assumed that 50 aircraft would be lost and 40 would be "turn backs" on the original mission. The conclusion, however, was that with 100 aircraft available each time over the target, the total destruction could be accomplished in nine additional missions over a period of a month to six weeks.

While the detailed planning for the Ploesti mission was under way, the three additional groups had arrived from the United Kingdom. They had played their role in the Sicilian operations and had undertaken their intensive training in preparation for the attack on Ploesti.

CHAPTER III

THE TRAINING AND BRIEFING FOR TIDAL WAVE

The Headquarters of the IX Bomber Command, in the summer of 1943, was located at Berca No. 2, a suburb of Bengasi. The two heavy bombardment groups of the command, the 376th and the 98th, commanded by Col. Keith K. Compton and Col. John R. Kane, respectively, were stationed nearby. The 376th group, original American combat unit in the Middle East, had grown out of the Halverson Detachment, which had arrived in Egypt in May 1942. The 98th had appeared on the scene only three months later. Both had supported the Allied forces throughout the North African campaign by making long-range attacks on enemy port installations, shipping, airdromes, and other important targets. In this work they had operated over dangerous desert terrain, enemy territory, and the sea, without fighter escort. The 376th and the 98th were veteran groups with a fine record of achievement.

The IX Bomber Command, in preparation for the coming HUSKY and TIDAL WAVE operations, added considerably to its installations. Preparations were made in the Bengasi area for the reception of the three additional groups scheduled to arrive from the Eighth Air Force. Two of these, the 44th, under Col. Leon W. Johnson, and the 93d, commanded by Col. Addison E. Baker, also were thoroughly experienced, and quite conscious of the important role that they had been playing in the European Theater of Operations. The 44th seemed rather proud

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of the losses that they had sustained. The 93d, which during the preceding winter had served in the Middle East, had suffered few casualties. Unlike the others, the 389th, Col. Jack W. Wood commanding, was new and inexperienced.

Although General Eisenhower, shortly after approving the Ploesti project, made known his desire for the dispatch of the three groups to North Africa as soon as practicable, delays ensued.[1] This was due principally because of the late arrival of replacement combat crews and of certain elements of the 389th Group in the United Kingdom.[2]

The three groups, however, were dispatched from Portreath, England, to Oran, Algeria, and from thence proceeded to Bengasi. The 93d took off on 26 June, the 44th on 27 June, the 389th on 2 July, arriving in the Middle East one day later in each case.[3] The last plane of the three groups, completing the movement of 123 B-24's did not depart until 9 July. Each group carried with it, besides its flight echelon, a limited number of ground technicians. One plane crashed en route to Portreath; another landed in transit at Lisbon. Everyone at the receiving end turned out to give the newly arrived crewmen a hand and within less than a week the HUSKY operations were inaugurated.

HUSKY participation amounted to intensive effort extending over the period from 2 to 19 July, inclusive. Instead of the estimated five group missions, or 600 sorties, 10 missions each for the four

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experienced groups and six for the 389th, representing 1183 sorties, were flown. These operations extended a week beyond the time originally planned.[4] The HUSKY plan called for attacks on enemy airdromes and communications in eastern Sicily, southern Italy, and Crete by the Ninth Air Force while the Northwest African Air Force pounded similar objectives in western Sicily and Sardinia. Towards the end of the campaign the two forces attacked the same targets almost simultaneously. Seventeen different targets were attacked, including the Littorio marshalling yards at Rome, where the 389th Group, although on only its sixth operational mission, made the best showing.[5] Despite the fact that 8455:19 operational hours were flown there were only 18 airplane losses, 10 of these in combat, the remainder due to operational causes. The percentage of losses for each initiated sortie was 1.6%. HUSKY operations for these groups ended with the raid on Rome on 19 July. Thereafter, it was decided to spend 12 days on preparations for mounting the TIDAL WAVE operations. Two days at the beginning and end of the period were allotted to maintenance, the remainder to training and briefing. The command welcomed this opportunity to catch up with the work that had accumulated as a result of the 13 days of intensive operations.

For ordinary bombing missions no special training is required and briefing is a matter of a few hours, at most. The Ploesti mission, calling for an attack on a target approximately a thousand miles distant at minimum altitude was definitely no routine matter. The crews had been trained to operate at high levels and the type of

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aircraft which they flew was ill-suited to ground strafing. A great deal of training was necessary to develop a new technique and the crews had to be persuaded that, despite handicaps, the benefits promised justified the risks.

Prior to leaving England for North Africa the 201st Provisional Combat Wing trained in low-altitude mass flying and bombing.[6] Tests were conducted which demonstrated the practicability of this type of operation and a flying technique was developed which greatly influenced that decided on for TIDAL WAVE.[7] Especially active in this work were Col. E. J. Timberlake, commander of the 201st Provisional Combat Wing; Lt. Col. A. E. Baker, commander of the 93d Group; and Maj. J. L. Jerstad. The results of this experience are set forth in two memoranda, drafted at the time.[8] The success of the Ploesti mission was believed to depend on closely coordinated group units within the combat wing and on a low, flat, compact formation attainable only through continued practice on simulated missions. A procedure, outlined in three phases, for attaining efficiency in training for these objectives, was tried with a fair degree of success. In the first phase, six-ship flights were to be trained in basic maneuvers; in the second, two six-ship flights; and in the third, two or more sections of 12 aircraft were to be brought together in waves over the target. At each stage the training was to become more advanced and, in the final one, actual conditions were to be simulated as far as possible. Because of the danger of mass flying at minimum level, it was suggested that 500

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feet be adopted until such time as the groups became thoroughly familiar with the problems encountered. When proficiency was attained at 500 feet, the altitude could be lowered. It was recommended that element leaders and flight leaders should be selected and taught one specific lead position. Alternate flight leaders should fly as co-pilots with the leaders.

Meanwhile the groups of the IX Bomber Command were also training in low-level flying. When the five groups came together, even during the period of participation in the HUSKY operations, training continued without interruption.[9] In the brief periods between missions the crews found opportunities to train. From 19 July until 1 August no missions were flown. In this period fell the intensified training that preceded the mounting of TIDAL WAVE. Colonel Timberlake was charged with training operations.[10] He was assisted in this work by various other officers, especially Major Jerstad and Capt. L. F. Schmid of the AAF, and G/C D. G. Lewis, operations expert, and W/C D. C. Smythe, low-level bombing expert, of the RAF.

Prior to the beginning of intensive training a comprehensive Training Plan was developed which greatly elucidates this phase of the Ploesti project.[11] The general objective of training, as given, was to prepare the five bomber groups for a low-level attack on a specific target by emphasizing the method of getting a large number of aircraft over the target within vertical and horizontal limits in the shortest possible time. The specific objective was to train

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individual crews in low-altitude bombing. Flights of six airplanes were to be trained in low-altitude formation, low-altitude bombing in formation, echelon flying, working toward a company front, and practice on corrective turns in both directions. Target forces of 18 to 36 aircraft were to receive practice in taking off and forming rapidly, in route formation, method of changing from route to bombing formation, in continuing low-altitude flying in bombing formation with slight corrective turns. At least four simulated missions were to be carried out, two coordinating all the target forces. These were to involve practice in all the essential maneuvers of the projected operation, and especially an effort was to be made to get the entire force over the target in about 30 seconds.

It was estimated that the training outlined would require a period of 10 or 14 days, devoted exclusively to the TIDAL WAVE project. During this time the crews should not leave the Bengasi area. Target force commanders should be selected at once on the basis of leadership and ability to train their forces and should be informed in advance of the mission and thoroughly familiarized with the problems arising from it. Commanders would have to be made to realize that the ultimate success of this attempt would depend on how well their forces were trained. For this they were to be fully responsible. All training for the project would have to be carried out within an individual target force. Commanders should have every opportunity to become familiar with their crews, and the target forces should, if possible, live together, study together and be based

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together during the final training period.

A dummy target was to be laid out at some suitable place in the desert in such a way that the axis of attack might be simulated, and individual targets located in conformity with their actual position. In addition individual practice targets were to be available at all times to target force commanders. Briefing procedures, which are dealt with in a subsequent section of this chapter, were defined. Training was to be accomplished by target force commanders. Training policies and directives were to be the responsibility of the Special Staff.

The proficiency to be obtained was exactly set forth in the Training Plan. Individual crews were to be able to drop bombs at a level no higher than 300 feet with a maximum circular error of 100 feet, and to navigate at minimum altitude to the target with no greater than 5° corrective turns from the IP to the target. Flights, composed of six aircraft, were to be able to take off and form within 10 minutes, change from route formation to the six-ship company front during the turn from the IP to the axis of attack, bomb from a height of 300 feet, at most, specific targets assigned to individual aircraft with a circular error of not more than 150 feet in each case, and resume route formation subsequent to bombing with minimum individual aircraft maneuver. Target forces were expected to be able to take off and form in not more than 50 minutes, to change from route formation to four 12-ship company front waves during turn at IP to axis

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of attack, to make corrective turn up to 5° in either direction when in wave formation without stretching out the formation, to pass over the target in not more than 30 seconds, to bomb individual targets with no greater maximum circular error than that allowed in the case of the six-ship flight, and to resume route formation after passing over the target. Each group commander was to see to it that each target force attached to his group received the maximum amount of training and maintenance aids.

A Training Program for minimum-altitude bombing was also produced to supplement the general Training Plan, just outlined.[12] The training in bombing was to be carried on by individual ships, by 3-ship elements, and by 6- and 12-ship waves. In the first instance, each bombardier was to drop a minimum of 10 bombs from an altitude of 100 feet and at an air speed of 190 to 210 miles an hour. Any available vertical target might be used. Unless the altitude at the target were definitely known and were in the immediate vicinity of the landing field the pilot should set his altimeter by flying over the target at a very minimum altitude. All runs on the target should be made from a minimum low-level approach of five miles. The pilot should concentrate on having his airplane in level flight at least three seconds prior to the release and especially should maintain level flight until the instant of release. While the first five bombs were to be released without correcting for personal error, the second five were to be dropped with corrections for personnel error as obtained from first five releases. Bombardiers

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should direct the pilot over the center of the target by use of interphone communication. In the case of the three-ship elements, each bombardier was to drop a minimum of six bombs using personnel corrections as obtained from individual ship bombings. As in individual-ship bombing, the setting of the altimeter, low-level approach, and level flight at the instant of release of bombs were to be emphasized; however, in this case, bombardiers in lead ships only were to direct pilots over the center of target. Other ships were to fly close formation and release for range only. As for the training of 6- and 12-ship waves, each bombardier was to drop a minimum of 4 bombs, using personnel correction. The setting of the altimeter, low-level approach, and level flight at the instant of release were, again, factors of very great importance.

The construction of a dummy target was at once undertaken and completed just in time for the opening of the intensive training program. This was primarily the work of a RAF intelligence officer, W/C J. S. Streater, under the direction of Lt. Col. S. L. Brown, 835th Engineers. The dummy target was laid out in a remote section of the desert near Soluch, near Bengasi. A flat reproduction of the Ploesti targets was marked off, exact as to size, major details, and relationship of parts.[13] Anything available that would show up well from the air was utilized to delineate refineries. Contrary to an erroneous impression that has arisen, the individual targets were not constructed in three dimensions. Such a reproduction would have meant running the risk of identification by enemy photo-reconnaissance

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planes, which frequently scouted the area from Cretan bases, whereas the dummy as actually devised was intelligible only to the initiated. Steel girders were set up at the corners of the range as markers and topped with mattresses to make them visible from the air. When pilfering Arabs carried off the mattresses they were replaced by strips of cloth which also disappeared. Finally, punctured five-gallon gasoline tins were put up with better results. The area of the dummy target was carefully guarded, only military personnel being allowed to enter. Its natural isolation helped to guard the secret it held. On 20 July, General Eisenhower reported to General Marshall that all training programs for TIDAL WAVE had been established and staff work completed.[14]

The intensive training period opened on Tuesday, 20 July, with the briefing of group commanders, leaders and deputy leaders. General Brereton was present to strike the key note of the mission in a brief, but highly effective, talk.[15] At the close of the talk the assembled officers were shown for the first time the briefing aids that had been prepared and were introduced to the officers who had been responsible for preparing them. Later on, pilots and navigators were briefed for the fuel consumption test to be made the following day.[16] The second day, likewise, was devoted to preliminary briefing, lecturing and discussion by groups on the following subjects: low-level formation; fuel consumption; low-level bombing, conducted by group bombardiers; methods of turning at low level; the practice target at Soluch.[17]

Having personally seen the project launched, General Brereton wrote to General Arnold, as follows: "Tidal wave training is well underway. I am thoroughly pleased with the attitude of all Commanders . . . and the planning has been excellent. We will have a plane for every combat crew available which will be 185. . . . I think every possible contingency has been considered, and feel confident."[18]

Meanwhile, maintenance work was being carried on, preparing the aircraft that had just taken part in the HUSKY operations for the flying and bombing training scheduled for TIDAL WAVE. The intensive training period, which opened on 22 July, lasted through 29 July, two days before D-day. Training proceeded according to plan. The employment of approximately 200 airplanes in a coordinated low-level attack required flying virtually wing tip to wing tip and wave close on wave. This could not be done by amateurs and was achieved only after strenuous effort. During the first 5 days, training was by units--individual aircraft, 6-ship formations, 12-ship formations, target forces, and natural combinations of target forces. These were arduous days of training, days in which pilots learned to fly their heavy aircraft just a few feet off the ground for miles and miles. Navigators learned new methods of direction-finding under novel conditions, and bombardiers, using the new type of bombsight, learned to bomb the targets with a rare degree of coordination and accuracy. Critiques and discussions were an outstanding feature of the training. By the end of this phase of the training, each man knew the section

of the target assigned to his crew perfectly, and target forces were able to fly over their targets with not more than 60 seconds elapsing from the time the bombs dropped by the first wave had hit the target until those dropped by the last had struck.

One of the crew members who participated in this training wrote of it as follows: "We ran approximately twelve missions over the replica of the oil fields, approaching, attacking and departing exactly as we intended doing on the actual raid. Each element was given a specific dummy target . . . and we practiced until we could bomb it in our sleep. When we finally did get over the real Ploesti, our movements were almost automatic."[19]

A matter that caused considerable concern was whether or not the target information was up to date. It was feared that new installations might confuse crews or that smoke from smoke stacks might obscure pinpoints. In order to minimize these possible difficulties, the aircraft in running up over the dummy targets timed their runs so as to coincide precisely with the number of minutes and seconds it would take to run up from such points as railroad tracks or river beds to their assigned targets.[20]

General Brereton returned to Bengasi on 28 July in order to be present during the last stages of training and at the time of the mission itself. On 28 and 29 July the entire task force participated in two great coordinated mock missions. In the final dry run the carefully planned operation was executed without a hitch. In less than two minutes the dummy targets were completely destroyed by the

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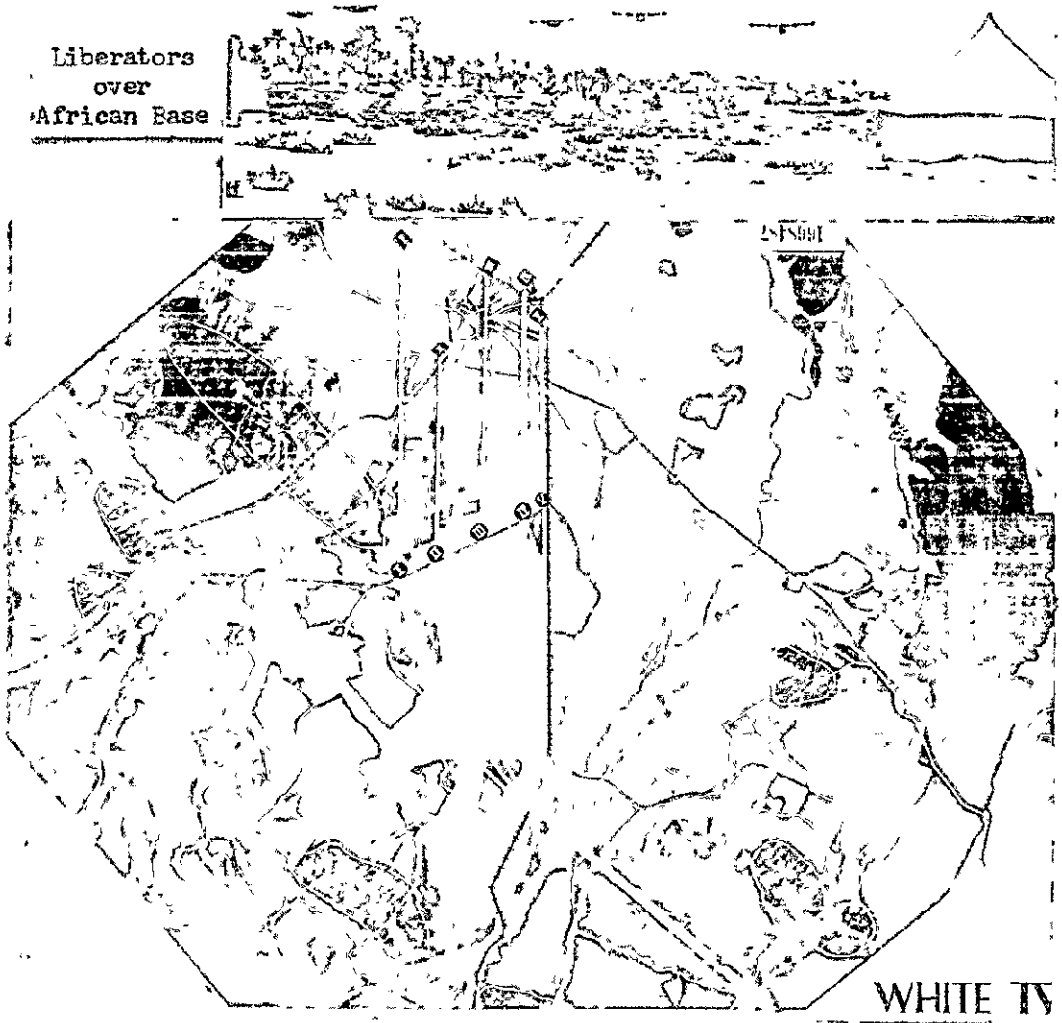
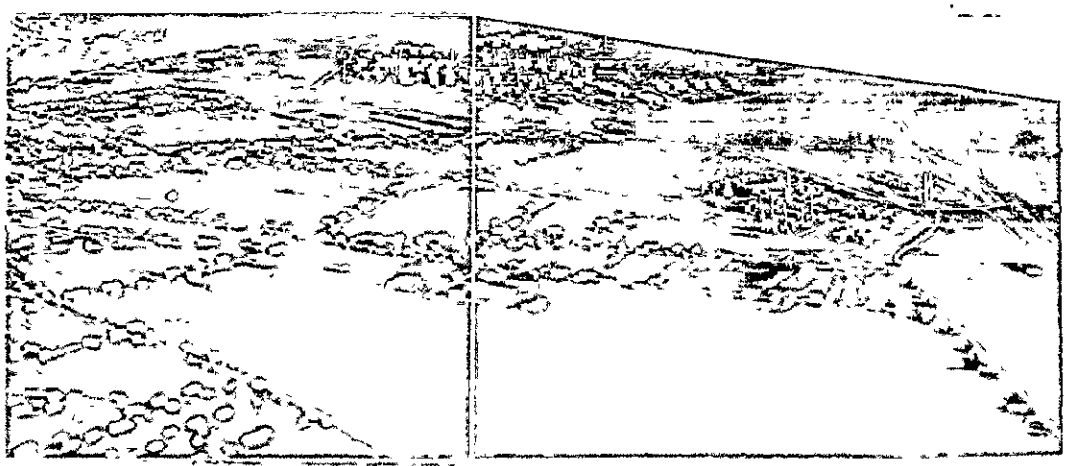
100-pound delayed action bombs carried by each of the aircraft on that occasion.[21] Thus, the crews demonstrated their readiness. The last two days of July were devoted to final briefing and maintenance on the planes.

The training aspect of the Ploesti mission was dependent upon briefing. These two aspects of the preparation for the mounting of TIDAL WAVE cannot be separated for they closely accompany each other, step by step. This mission presented the most difficult briefing problem yet encountered by the Army Air Forces. Detailed instruction was required in order that the crews might recognize the pinpoint targets assigned them, yet aerial reconnaissance of the target was ruled out because of the danger of warning the enemy of the impending attack. The solution of this problem is a tribute to the ingenuity of the intelligence officers of the Eighth Air Force and of the RAF officers who collaborated with them in preparing the briefing data used for the mission.

The comprehensive Training Plan discussed above contained a section on briefing.[22] This declared that the success of the mission depended on each pilot, navigator, and bombardier having a thorough understanding of the entire problem. They should understand the importance of the destruction of the target, possess a knowledge of the complete target area and the general plan of attack, the method to be employed by their own target force, and the specific target assigned to their own crew. In order to accomplish these things, it was deemed necessary to prepare a single large briefing room where crews and flight leaders might obtain and study information relative



Vertical Photo of the 1:50,000 Relief Model of the Ploesti Area
Showing Routes of Target Forces. Taken from Target Sheet.



Oblique Photo of a Section of the Detailed Model of Ploesti
Showing Targets White IV and V. From Forest Service

to the project. In addition, each target force should have a room containing briefing material pertaining to its target alone. These briefing rooms or tents should be established early enough to enable all crews to study the problem thoroughly. One briefing crew was to be designated as the chief briefing unit for all target forces and it was to compile data and establish standard briefing procedure so that all forces, even though on separate airdromes, would receive identical briefing.

The following briefing schedule was adopted:[23]

20 July:	Briefing of Group Commanders, Flight and Deputy Leaders. General Ent /General Brereton?/ was to open the briefing by describing the significance of TIDAL WAVE in relation to the current war situation. A briefing film was to be shown. Major Geerlings was to describe the whole operation, making use of his target material and the Medmenham models. The leader of the operation was to describe the defenses of the target in relation to surprise attack.
24 July:	The TIDAL WAVE film and pictures were to be shown to officers of the crews.
29 July:	Enlisted crewmen were to see the film.
29-30 July:	Major Geerlings was to describe the entire operation to officers of each flight and also speak of the defenses in relation to the attack.
31 July:	Final briefing was to take place. Group Commanders were to repeat General Brereton's description of the significance of TIDAL WAVE in relation to the current war situation. A final checkup was to be made on target details. The film was to be shown again if considered necessary.
Security Lectures:	Intelligence officers were to insure that all crews were thoroughly security trained before the mission.

It appears that this schedule was closely adhered to.

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The officers especially concerned with the briefing were Lt. Col. P. S. Zuckerman, assistant intelligence officer of the IX Bomber Command; Lt. Col. W. L. Forster, of the Combined Chiefs of Staff, Washington, an Englishman who had lived at Campina and who for about eight years had operated the Astra Romana refinery at Ploesti; W/C J. S. Streater, RAF intelligence officer; Maj. G. K. Geerlings, target expert and intelligence officer of the Eighth Air Force; and Capt. M. G. Phipps.[24]

In the absence of reconnaissance photographs, it was necessary to sift an enormous amount of material for detailed briefing data concerning the mission and to interview numerous individuals who had firsthand knowledge of the Rumanian refineries. One of the best sources of intelligence data was the Admiralty Library at London, which maintained a catalogued file of thousands of photographs, clippings, etc., collected since the opening of the war.

The briefing materials employed in connection with the TIDAL WAVE project fell within four classifications: maps, models, illustrations, and prepared information.[25] The maps included a small-scale map of the entire route of flight to and from the target, a large-scale map of the Ploesti area and one of the general region of Campina, together with various small-scale maps of eastern Mediterranean regions where aircraft might be forced to land. Five models were constructed. Those of Ploesti, Brazi, and Campina were on the scale of 1:50,000, while models of the general areas of Campina and Ploesti were on the scale of 1:500,000 and 1:100,000 respectively.

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The illustrations consisted of photographs, drawings, target sheets, target maps, pictures, etc. Information was assembled on a wide variety of subjects pertaining to the refineries and the general area: RAF information sheets on individual refineries; detailed descriptions of the route from Pitesti to Ploesti and from Pitesti to Campina; notes on Rumania; memoranda on suggested ways of escape from Rumania, and conditions affecting escape in the Balkans; a phrase list for Balkan countries; a list of available airdromes; and a briefing movie. Certain of these briefing aids were so unusual or important as to call for special description.

A new navigational aid was a map measuring about 23 inches square which was so pasted together and folded as to make it unnecessary for the navigator to use a series of separate maps. A printed strip 6 1/2 inches wide and 33 inches long was fastened with paper clips along the left edge of the navigational map, consisting of 11 details, drawings, and photographs of the main check points along the route. Three narrow columns along the right edge of the map were provided for the navigator's log, under the headings "Distance in miles," "ETA and Altitude," and "Magnetic Headings."[26]

One of the chief aids rendered by the RAF was the construction of various scale models of the targets and relief maps of surrounding areas. These models, constructed within one week, were transported to North Africa by airplane. There they were made available to the crews who were expected to familiarize themselves thoroughly with them. Thought and care had been exercised in planning for the mission

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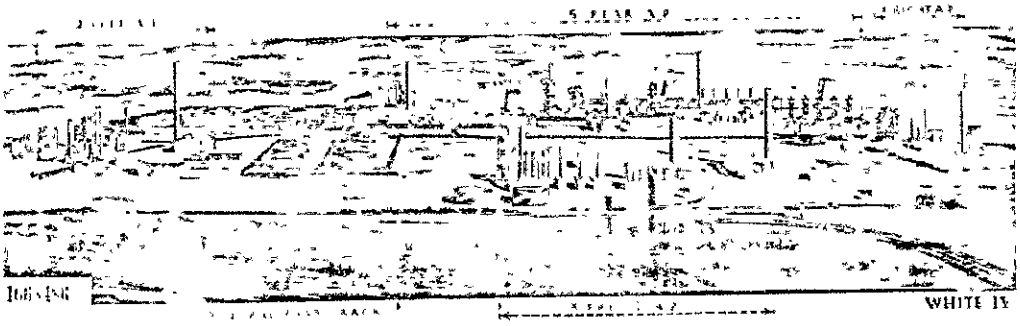

Photo of Target White IV As It Would Appear Only a Few Hundred Feet Away. From Target Sheet.

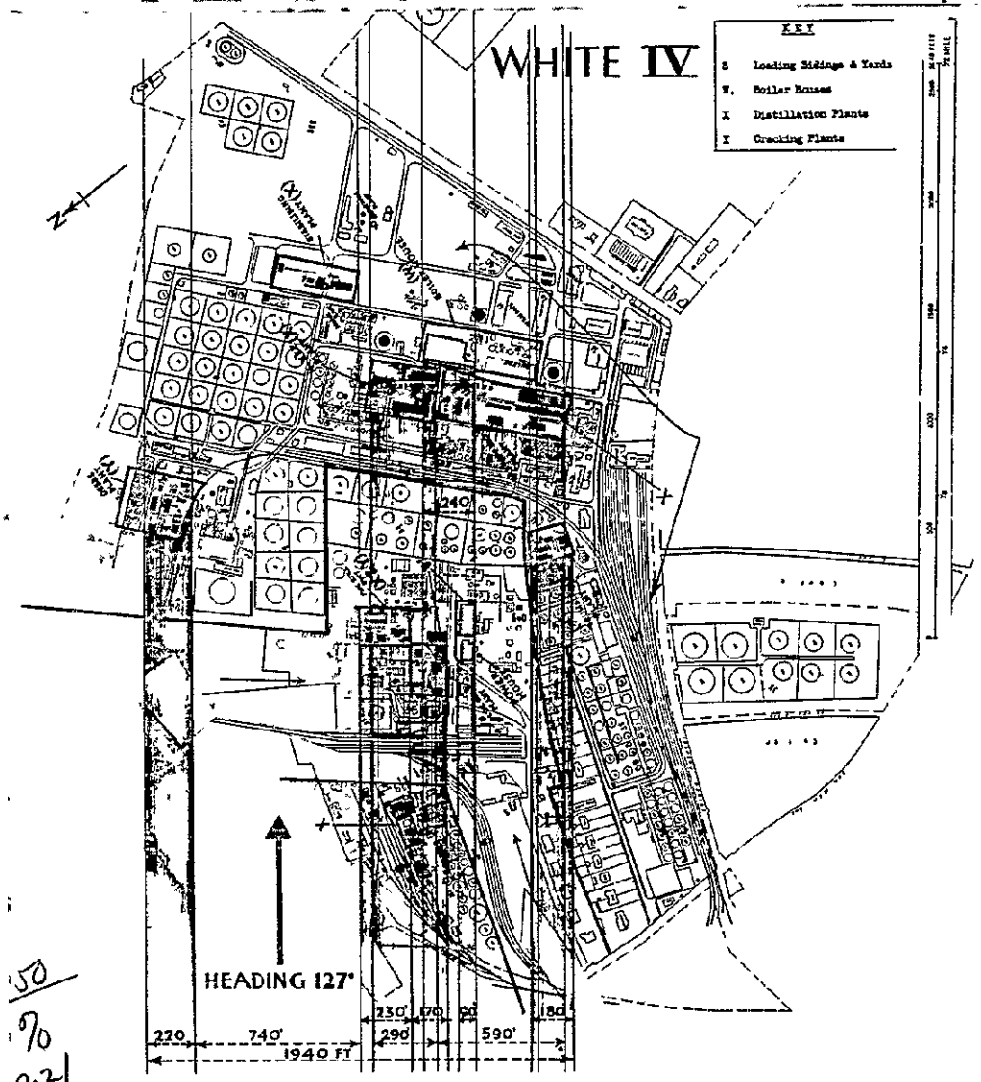

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Diagram of Target White IV Showing Pinpoint Targets and Plan of Attack. From Target Sheet.

and thereby served to emphasize its significance, for never before had crews been provided with carefully constructed models for study on their own airfields.[27]

Under Major Geerlings' direction target folders were prepared of unexcelled merit. Their principal feature was a new type of perspective drawing of each refinery. Each crew was supplied with its own target folders, including target map sheets upon which were printed photographs of the drawings and oblique views of the various models to show how the target would look to each crew coming in on correct heading at minimum altitude at varying distances from the target. On the reverse side was a large-scale, detailed plan of the target area. In view of the fact that the available materials were often inadequate a great deal of imagination, as well as patience, had to be exercised in preparation of these aids. Nevertheless, the bombardiers who carried out the attack and the photographs made during and subsequent to it all attested the accuracy of the sketches and models.[28]

Details of aiming points for each bombardier were prepared. Sometimes portions of the comprehensive perspective view were adequate; again they had to be amplified by more detail. Bombardiers were briefed to look only for structures which stood up well into the air, and to disregard low-lying ones. The bombardiers had all their necessary data on two pieces of paper: the target map sheet and the detail of the aiming point.[29]

A unique and highly effective briefing aid was a 45-minute movie, the fruit of the combined labors of British and American officers over a period of three weeks. It presented intelligence material that had been carefully gathered and sifted over a period of several months. The movie fell into three general sections. An introductory section set forth general information of interest to all participating crews; the second section was of interest primarily to navigators and pilots; and the final one was addressed to bombardiers. The general impression created by the film was that the job was a tough, although by no means an impossible, one and that its importance justified taking any risk. The crewmen were told that they could not see it too often, and were asked to digest it in detail. It was so arranged that pilots, bombardiers, and navigators could simultaneously study those portions of the film that were of special interest to themselves alone.[30] The principal purpose of the movie was to insure uniformity of briefing and the omission of no important information.

Much of the time devoted to briefing was spent with specialists in intelligence and low-level bombing. The crewmen were taught the rudiments of oil refining, what the key installations were, and how to put them out of commission. Both slow and fast movies were made of the model oil fields, and these were shown to accustom the men to the appearance of the refineries when approached by a low-flying plane. Time was also spent discussing the problems of low-level

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bombing and the reasons for it. Pertinent phases of international law were expounded. The men were told to let themselves get captured if they had to land in enemy territory and then try to escape. If captured in civilian clothes after having first been captured as soldiers they might expect only to be interned again, but on the other hand, if captured for the first time in civilian dress they might be shot as spies. They were supplied with various equipment which might aid in their escape, purses containing U. S. money and money of the countries in which they might be forced to land,[31] small steel files, compasses, etc. While it was suggested that it would be useless for them to carry revolvers because they would not be able to use them, this was apparently left to their own discretion.[32]

In the beginning the reaction of the individual crew members to this unusual mission had been lukewarm, at best. It seemed too radical. When the whole matter was laid before them, however, and its importance explained, earlier doubts gave way to enthusiasm. The elaborateness of the briefing data created the impression that the mission was in a class by itself; for no other had there been a movie, models, and so much briefing material. It has been suggested that the results might have been better if the officers had not been acquainted with all the briefing data until 5 to 4 days before the mission was to be carried out, instead of 12 to 8 days. As it was, the planning committee observed that toward the end there were questions indicative of worry, especially concerning the hazards of

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flying through a balloon barrage.[33] However, a feeling of confidence was restored by the presence of General Brereton and Air Chief Marshal Tedder the day before the mission. They, together with General Ent, made the rounds of the camps that afternoon and evening addressing words of encouragement to the men and emphasizing the importance of the undertaking. Tedder spoke as follows: "I'm proud to be here with you just before this job. I want to wish you the best of luck in it. It's a hard, dangerous mission. It will take all of your famous American courage and resourcefulness."[34]

In the end it was difficult to determine who should be allowed to go and who should be left behind.[35] This, despite the fact that the hazards were openly admitted and "the crews' unofficial estimates of their chances ranged between fifty per cent and 'suicide'."[36] Colonel Smart, speaking from experience, declared:

> I am convinced that no operation, however hazardous it may be, is too dangerous for the American combat crew member to willingly undertake so long as he knows the target he is attacking is well worth the effort expended and the lives and the material that may be lost in accomplishing its destruction. Our crews are brave, but they are also smart. They cannot be fooled; nor must we ever underestimate the danger involved in any mission on which they may be sent. Such is entirely unnecessary. We need only to convince them of the importance of the Target and impress upon them the fact that they are being given a task which cannot be accomplished by any other means and that their accomplishment of the task, even if heavy losses are sustained, will eventually result in the saving of lives.[37]

While this intensive training and briefing were under way, maintenance was also playing its highly significant, if less spectacular,

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role in preparing for the missions.[38] A large part of this work was done by the repair squadron of the 26th Air Depot Group.[39]

It had been determined that 186 aircraft would have to take off in order to insure 156 reaching the target.[40] Actually, at the opening of the 12-day period of preparation there were 191 aircraft available, but only 131 of these were operational. During the period 11 additional ones were added. The primary cause for such a high percentage of non-operational airplanes was the lack of engines and machinery necessary for overhauling engines.[41] Because of dust conditions in the Middle East resulting in excess cylinder and piston ring wear, the average engine time of the 1830-43 engines used in the B-24 airplanes was less than 200 hours between overhauls. Every effort was made to secure more engines and to increase overhaul production. Most of the overhaul work for the Ninth Air Force was done by BAF shops.[42] It was necessary to remove the Sperry retractable ball turrets from the aircraft with which the 389th Group was equipped. The presence of this feature placed the center of gravity so far back that the consumption of gasoline was greatly increased, making it impossible for the airplanes so equipped to fly such a long range mission as TIDAL WAVE, and considerably reducing the speed.[43]

In order to provide sufficient fuel carriage capacity for so long a flight an additional releasable fuel tank was added in the bomb bay of each aircraft. Besides equipping the nose of each leading airplane with an extra .50 cal. gun, the top turret guns

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of each leading ship were so arranged that they could fire foreward, thus enabling them to strafe the whole area, while following planes protected their rear.[44]

By 30 July, just two days before D-day, sufficient engines were on hand for all craft, but little time remained in which to make the installations. However, by dint of herculean effort, by late afternoon the next day, on the eve of the mission, 193 aircraft were in commission out of the total of 202. This number appears to have been slightly in excess of available crews. After the last briefing the airplanes were checked over as never before. Before the long mission was over many a combat crewman had reason to be thankful for the careful and efficient work of their ground crews.

The weather section having pronounced its last-minute blessing, the mission was on.

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TABLE III. OPERATIONAL RECORD OF FLOESTI MISSION

Target Force Group Commander	A/c Desp-pchd.	A/c Turn-Backs	A/c Rchd. Target	Target (1) Asgd.	Target (1) (2) Bombed	Est. Destr. Refin. Cap. (6 mos.)	A/c Losses in Action	A/c Losses in Turkey	A/c Losses Misc. Causes	A/c Losses Total Lost	A/c Rctd. Home Base	A/c Rctd. Other Bases	A/c Rctd. Dam-aged	E/a Claimed Destd.
White I (376th) Col. Compton	(3) 28	1	26	Wh. I	6? A/c Wh. II	0%	1	1	(3) 1	3	23	1	6	1
White II (93d) Lt. Col. Baker	25	5	32	Wh. II	Wh. II? III? IV, V	15%	11	2	0	13	15	4	13	2
White III (93d) Lt. Col. Baker	37 12			Wh. III		0%								
White IV (98th) Col. Kane	(4) 47	7	39	Wh. IV	Wh. IV	Astra 50% Orion 30%	18	(5) 1	(6) 2	21	(8) 9	10	14	33
White V (44th) Col. Johnson	17	0	37	Wh. V	Wh. V	100%	7	2	(7) 2	11	22	4	(9) 15	13
Blue (44th) Lt. Col. Posey	37 20			Blue	Blue	100%								
Red (359th) Col. Wood	29	0	29	Red	Red	100%	4	2	0	6	20	3	(10) 10	2
Total	178	13	163			42.5%	41	8	5	54	89	22	58	(11) 51

(1) Targets: Wh. I, Romana Americana Refinery; Wh. II, Concordia Vega; Wh. III, Standard Petrol Block and Unirea Sperenta; Wh. IV, Astra Romana and Unirea Orion; Wh. V, Colombia Aquila; Blue, Creditul Minier, Brazi; Red, Steaua Romana, Campina. (2) Statistics on bombs dropped vary greatly. It is quite impossible to say how many were dropped on targets. (3) One A/c crashed at sea en route to target. (4) One A/c crash-landed attempting to land just after taking off. (5) This A/c crashed in the sea just off the Turkish coast. (6) Besides the A/c that crash-landed taking off ("5"), one crash-landed in Cyprus en route home. (7) Two crashed at sea en route home. (8) An additional one crash-landed on return home. (9) One is uncertain. (10) Three are uncertain. (11) A report considered reliable by a local agent placed enemy losses at four German and eight Rumanian fighters, and 20 damaged.

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CHAPTER IV

THE EXECUTION OF THE MISSION

The Ploesti mission of 1 August 1943 was one of the most daring ventures of World War II and was in keeping with the finest military traditions of the nation. The participants, a majority of them veteran airmen, were impressed by the importance of the undertaking and conscious of the fact that they were making history.[1]

Impatiently awaited D-day at last arrived. Long before daybreak on 1 August the tented areas of the landing grounds of the IX Bomber Command near Bengasi were astir with life.[2] The ground crews were up ahead of the combat crews, working on the planes, putting on the finishing touches. Before long, trucks were rumbling across the desert carrying crews to the planes. As dawn approached dust arose here and there across the desert as the engines were started and began to hum. Fainter sounds familiar to the airman preparing to take off were drowned by the heavy drone of the engine and the whir of the huge propeller blades thrashing the air. One by one, in rapid succession, the Liberators swept down the runways and then into the air, circling wide and heading into formation. The five groups assembled singly at first, gradually increasing in number as they were joined by individual planes, meanwhile sweeping the sky in gigantic circles. Virtually all of the airplanes took off between 0400 and 0500 hours. A few ships of the 93d Group were delayed by dust in the airdrome. These followed as stragglers, gaining their

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position in the formation before the Mediterranean was crossed. One plane belonging to the 98th Group crashed and burned in trying to return to the field after taking off.[3] When the entire formation was finally complete, the sky over Bengasi appeared full of B-24's. Then, quickly they vanished in the direction of Tocra, heading straight out over the Mediterranean in the direction of Rumania.

The force which successfully took off for Ploesti numbered 177 Liberators carrying a cargo of demolition bombs well in excess of a half million pounds. The aircraft of the 376th and 98th Groups, stationed permanently in the Middle East, were painted the usual desert pink, while those of the three assigned groups were dull green. The ships, which bore such prosaic designations as 754-U, 215-S, and 298-V, were known affectionately to their crews by such peculiarly American names as "Hail Columbia, "Suzy Q," and "Sad Sack." Each ship normally carried a crew of 9 or 10 men, but in a few cases the number was as high as 11. All of the 1,726 men who manned this powerful air armada were Americans, with but a single exception.[4] They represented every state of the Union and the District of Columbia, and virtually all the national strains that had gone into the composition of the American nation.[5] General Ent of the IX Bomber Command who commanded the expedition, was a passenger in the plane of Colonel Compton, commander of the 376th Group.[6]

The five groups proceeded, well spread out across the Mediterranean. The 376th led the formation followed by the remaining groups in the order listed: the 93d, commanded by Colonel Baker; the 98th,

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Colonel Kane commanding; the 44th, with Colonel Johnson as commander; the 339th, under Colonel Wood.

It was originally planned that Colonel Compton, as commander of the 376th, should lead the formation in the attack. Shortly before taking off, however, he appointed 1st Lt. B. W. Flavelle, one of his squadron commanders, leader of the 376th and, thus, leader of the entire force.[7] The weather was fine all the way across the Mediterranean, the groups having no difficulty in maintaining visual contact. The formation flew low at an altitude of from 2,000 to 4,000 feet. Just south of Corfu, Colonel Compton gave the signal for the climb to 10,000 feet, at which height the island was to be passed and the mountains of Albania and Yugoslavia crossed. The leading ship piloted by Lieutenant Flavelle, instead of responding, showed signs of distress by a definite wing wobble. The ship made a sharp turn in steep bank, then went into a dive to approximately 100 feet. Attempting to pull out of this, it, instead, went into a tight spiral and straight into the sea, exploding as it hit and sinking immediately.[8] Leadership of the formation now devolved upon the deputy leader, who, without a hitch, proceeded to perform his task, exactly as prescribed.

General Ent and Colonel Compton, whose plane was in one of the following elements of the leading group, were not aware of the fact that the plane which had plunged into the sea was that of the leader, and of the consequent change in leadership. This change, however,

contrary to a notion that has arisen, does not appear to have had any special significance in the subsequent course of events.[9]

Slightly to the northwest of Corfu, a northeasterly course was taken across the Albanian mountains, as planned. Soon after leaving the coast, the formation encountered very heavy cumulus clouds from 10,000 to 15,000 feet and lowering. Over Yugoslavia the clouds started settling in until there was only about a thousand feet of visibility over mountains which towered in some instances as high as from 6,000 to 8,500 feet. Under these adverse conditions the formation spread out, even within sections. The unity of the formation was destroyed when the 98th Group lost sight of the leading element of the force, consisting of the 376th and 93d Groups. After losing the forward element once, the 98th Group subsequently regained contact. According to Colonel Kane, the advanced unit was at that time about 30 miles to the left of the prescribed course and several thousand feet higher than the 98th, which was flying at 14,000 feet and leading the two remaining groups through the towering cumulus clouds.[10] Unity was definitely lost, however, within 200 miles of the Danube, when cloud formations were encountered, which could neither be penetrated nor avoided by flying around them. Unlike the two advanced groups which flew over the clouds, the 98th Group, followed by the 44th and 339th, deemed it necessary to descend and fly under them.[11]

At the Danube the weather cleared. The leading element reached the Danube at a different point and somewhat in advance of the

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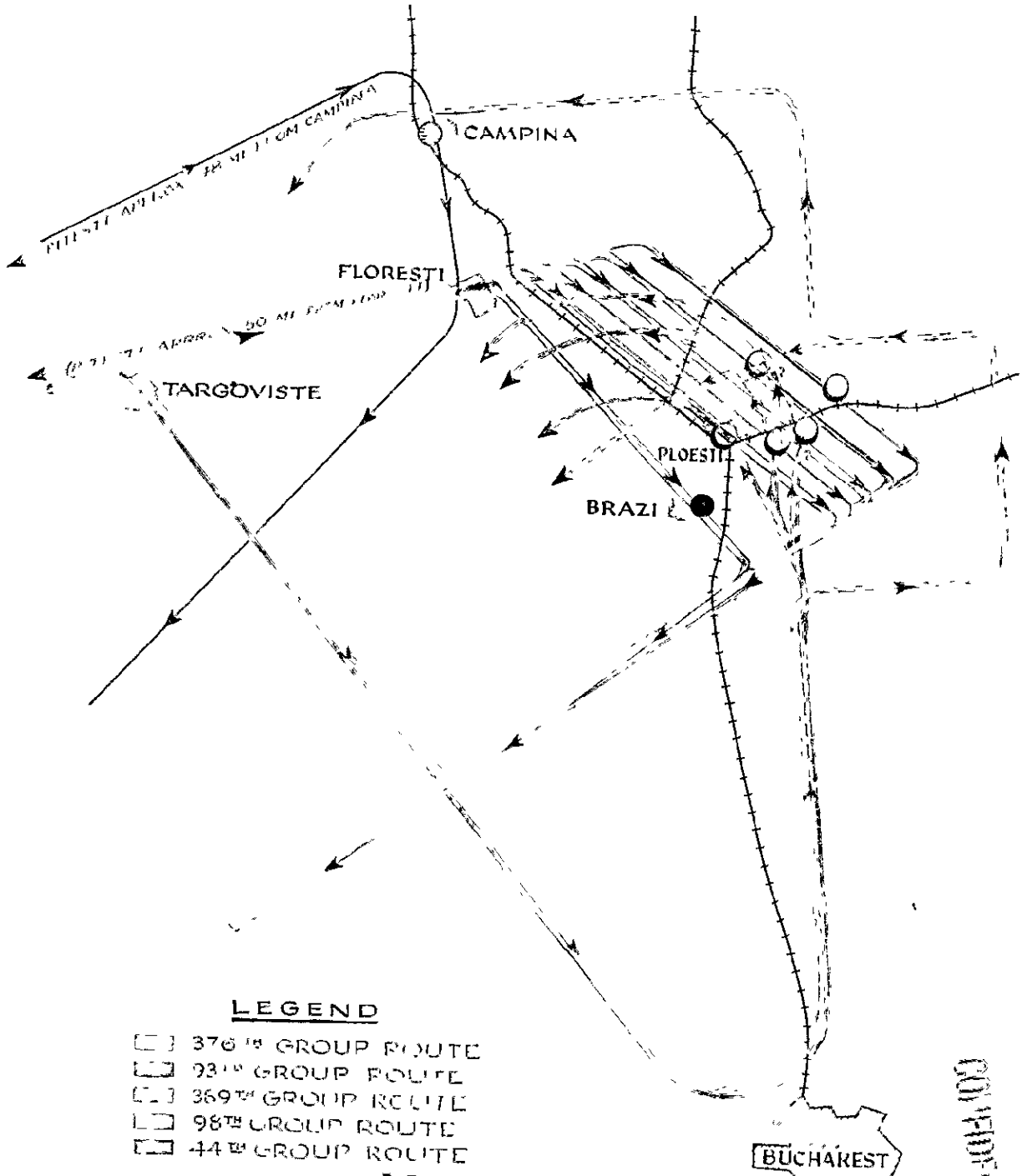
THE ATTACK AS PLANNED AND AS EXECUTED



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following unit. Then, for the first time, was it realized that only the two first groups were together.[12] Unity might have been restored by use of radio, but, in order to insure surprise, it had been decided in advance to maintain radio silence until the target area was reached, and now, rather than risk sacrificing this great advantage, that decision was upheld. So the leading element continued on the prescribed course across Rumania, at an altitude of about 3,000 feet. The 98th Group, on reaching the Danube, flew on a westward course for several minutes to give one of the accompanying groups, which it mistook for the 93d, an opportunity to take the lead.[13] When the mistake was realized, the 98th assumed the leadership of the rear element.[14] With hope of restoring the integrity of the formation at the Danube blasted, the rear element, likewise, proceeded on its way toward the target. Thus, the effectiveness of an integrated formation was lost, for the following unit reached the target somewhat later than the leading unit, after the target had been alerted.

Pitesti, designated as the first IP, was described as "a nondescript small straggling town situated at the confluence of two valleys."[15] Here the 389th Group (Red Target Force) was to break off from the larger formation and proceed to its isolated target at Campina. According to plan, altitude was reduced at Pitesti to minimum level, that is to say, to approximately 500 feet off the ground.

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Aside from the incidents described, the flight to Pitesti was uneventful, resembling a practice mission. No enemy opposition of any kind was encountered until the target area was reached. On this long mission only 13 aircraft turned back, almost all of them over the Mediterranean. The reasons given were loss of formation and development of mechanical defects, such as engine failure and gas leaks. Generally these planes, after wheeling out of formation, passed under the onrushing planes, midway down. Some member of the crew would announce the misfortune of the stricken ship over the interphone: "Another plane's turned back!" And sometimes there was waving between planes.[16] The Rumanian landscape presented a striking contrast with the parched desert region surrounding Bengasi, where no rain had fallen since April. The green and fruitful countryside, dotted with neat villages and crossed by pleasant streams and tree-lined roads, a scene reminiscent of the American Middle West, was a welcome sight. In some places the aircraft flew so low as to enable the crewmen to see the villagers standing about in Sunday dress, gazing and waving in friendly manner at the planes as they passed. "In that long ride," one crewman has written, "I don't think anybody said a word."[17] Another reports the men at first in a loquacious mood, engaging in a great deal of jesting. For example, the passing out of the rather tasteless lunch rations was the occasion for a round of "wisecracking." Nevertheless, as the time passed, a tenseness developed, and by the time the target was reached the men were highly keyed up.[18]

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Floresti, lying about 13 miles northwest of Ploesti, was the final IP designated for the 376th, 93d, 98th, and 44th Groups. Here route formation was to be abandoned for attack formation, the four groups reforming as six target forces to attack targets White I, II, III, IV, and V at Ploesti, and Blue Target at nearby Brazi. The 376th Group, followed by the 93d, separated from the remaining groups in crossing the mountains, proceeded along the prescribed course from Pitesti in the direction of Floresti. Upon reaching the vicinity of Targoviste, Rumania, a little more than midway to Floresti, Colonel Compton, commander of the leading group, still unaware of loss of the original leader designated by him, mistook Targoviste for Floresti and erroneously concluded that the leader in continuing the flight in an easterly direction had overshot the IP.[19] Accordingly, he broke radio silence and ordered a change of course which would have been right had the commander's identification of the IP been correct. Only later was it learned that the young officer leading the formation was on the correct course, that he knew where he was, and that had he not been ordered to change course he would, in all probability, have delivered the attack exactly as planned. The loss of the original leader, therefore, was in no way responsible for the mistake made in throwing the advanced unit off course. By following the new heading the two groups, now reformed as three target forces (White I, II, and III), flew in a southeasterly direction, not realizing that a mistake had been made until reaching the outskirts of Bucharest. Down to this point, complete surprise

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had been obtained. Unfortunately, Bucharest was the headquarters of Rumanian defenses and, now, the alarm was sent out.

Colonel Compton, upon recognizing Bucharest, realized what had happened. He at once directed the target forces to proceed northward, with the idea of reaching the IP and from there carrying out the attack as planned. Although the advantage of surprise was lost, the benefits derived from training and briefing might in this way still be saved. Proceeding northward on the 14-minute flight from Bucharest to Ploesti, the attacking force observed antiaircraft gunners running to man the guns, and barrage balloons, which had previously been down, were seen to rise. Approaching Ploesti, believed to be one of the most heavily defended targets in Europe, from the south, the attackers encountered increasing opposition, for as the minutes passed more and more of the defenses were alerted and took part in resisting the attack. In view of this heavy interference, Colonel Compton, having come to within a few miles of Ploesti, directed a change of course, this time in an easterly direction, with the intention of giving the defenses a wide berth and reaching the IP from a less heavily defended direction.[20] Instead of making the turn eastward, Colonel Baker chose to lead his White II and III Target Forces against the targets on the south side of the city, which had come into view. There is some uncertainty as to precisely which targets were hit by Colonel Baker's forces. All accounts agree, however, that Targets White IV (the Astra

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Romana and Unirea Orion refineries) and White V (Colombia Aquila) were hit. Unfortunately, these were targets assigned to the 93th and 44th Groups.[21] Some crews believed that they hit Targets White II (Concordia Vega) and White III (Standard Petrol Block and Unirea Speranta). This is uncertain. If they did so, no serious damage resulted.[22] There is no indication that any aircraft of the 93d Group attacked Blue Target (Creditul Minier at Brazi), which lay well within striking range of Colonel Baker's forces.

Although a slight haze and scattered, light showers were reported by the 93d and 376th Groups in the area of the target, the weather does not appear to have impeded operations. Visibility was generally said to have been fair, or even good.[23]

Thirty-two aircraft of the 93d Group, out of the original 37 that took off, are believed to have reached the target area.[24] One of these was brought down short of the target. The attack was delivered between 1150 and 1200 hours at altitudes varying from 100 to 300 feet. Enemy fighters and heavy flak were encountered on the outskirts of the town. One ME-109 and one FW-190 were claimed destroyed. The flak was for the most part inaccurate. Smoke pots were just beginning to send up a screen. Six to 10 balloons were noted south of Ploesti at an estimated height of 3,000 feet. Accurate light flak of moderate intensity and some machine gun fire was run into over the target. It was noted that a good job of camouflage had been done on the gun batteries. Bombs dropped caused

heavy explosions in refinery installations, as well as in oil tanks, which sent up great billows of fire and smoke. Eleven B-24's were brought down in the target area.

Meanwhile, the 376th Group (Target Force White I), in order to avoid intense heavy flak had turned eastward on its way around Ploesti in the hope of reaching the IP and carrying out the attack as planned. After flying for several miles the course was changed to northward, then westward. Coming within a few miles of Ploesti to the northeast,[25] in the vicinity of its target, the Romana Americana refinery, the 376th encountered such heavy antiaircraft fire that General Ent decided that the defenses, by now thoroughly alerted, were too formidable to carry out the attack as planned.[26] He directed, therefore, that any target of opportunity that presented itself should be attacked. Some of the planes released their bombs on tank cars in a marshalling yard northeast of Ploesti. Others bombed oil wells and storage tanks or jettisoned their bombs in open fields, lakes, and woods.[27] The major portion of the 376th Group flew northward beyond Campina, bypassing that town just a few minutes before the 389th Group (Red Target Force) arrived there, and thence southward in the direction of home. One element of the 376th, however, a flight of six airplanes led by Maj. Norman C. Appold, flew directly into Ploesti.[28] The crews believed they had attacked Target White II, the Concordia Vega refinery, on the northern edge of the city, at altitudes from 120 to 150 feet, at about 1205 hours.

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Some damage was inflicted on this target. This second most important of the Rumanian refineries would otherwise have come out of the attack unscathed. Major Appold's ships flew through dense black oil smoke and flames, emerging covered with soot. Although the 376th Group dropped most of its bombs in the general target area, only a small fraction of these were on an assigned target, and many were dropped on no target at all. Intense light antiaircraft and machine gun fire were encountered in circling the target, one airplane being holed some 200 times.[29] The low level at which the attack was made enabled the Liberators' gunners to turn their weapons with disastrous effect on the ground batteries which were well camouflaged in treetops, bushes, haystacks, and barns.[30] "It was the darndest thing ever," Major Appold declared, "While civilians in the streets waved at us, gunners on the house tops were shooting at us."[31] "Everyone waved at us," said another, "and we saw girls in their Sunday best, and little kids ran out into the streets. I saw one soldier with a gun on his shoulder, and he waved."[32] "It seemed like we were looking down gun barrels from every angle throughout the run," asserted a gunner. "It was the first time I had ever been fired at by a haystack. I got a great kick out of being able to shoot back."[33] A pilot agrees with this, saying: "We had the most fun picking off ack-ack positions. . . . As soon as we saw the flashes from any place everybody got busy turning on our guns.[34] As a major said: "The boys took a lesson in street fighting on this

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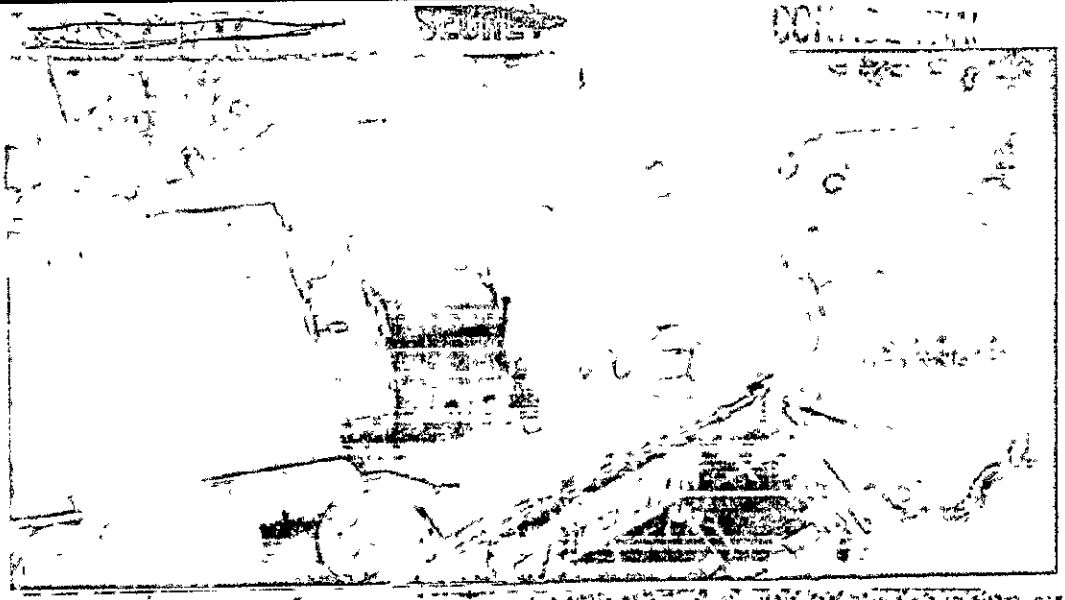
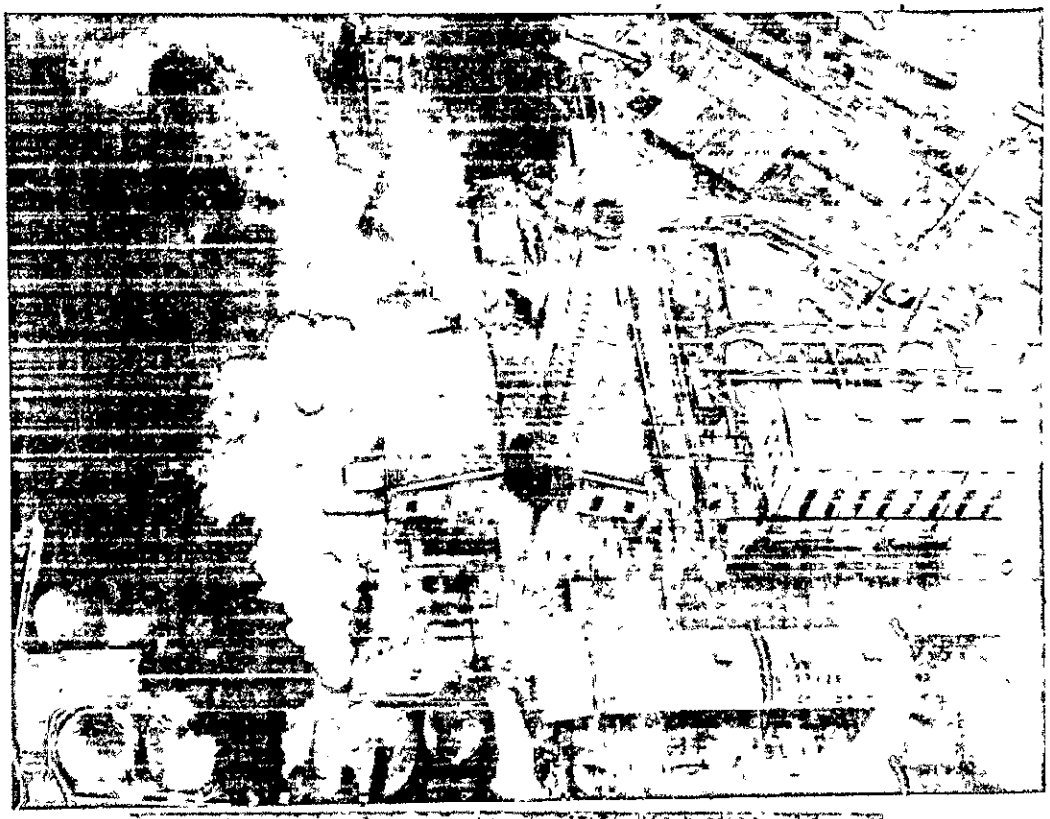


Steaua Romana Refinery. Incendiaries Burning among Workshops and Offices.



Steaua Romana Refinery. Damaged Boiler House.

mission."[35] Dummy oil installations were noted southeast of Ploesti. Eight to 10 enemy fighters, apparently looking for stragglers, made uneager attacks. One ME-109 was destroyed. Of the 28 aircraft of the 376th Group that set out on the mission, 26 reached the target area. Only one of these was lost in action.

Meanwhile, the following unit, consisting of the 98th, 44th, and 389th groups, proceeded in the direction of their targets more or less according to plan. At Pitesti the last of these groups, commanded by Col. Jack W. Wood, instead of continuing with the others on an easterly course to Floresti, swung northeastward up into the mountains to carry out its attack as Red Target Force upon the Steaua Romana refinery at Campina. These installations were situated in a valley with a slope toward the southeast. It was planned that the attack should come as a downhill run from the northwest to the southeast. The B-24's were to fly low up one valley, hop a ridge, then turn down another valley, there hitting the target.[36] Upon reaching the foot of the mountains, however, the Red Target Force found that the tops of the mountains were covered with clouds, which made it difficult to find recognition points, upon which the selection of the proper valley depended. Colonel Wood picked a likely-looking valley, made his run, and hopped the ridge, only to discover that he had chosen the wrong valley. This did not defeat the mission, however, for he made a 180° turn and flew northward up the next valley, then hopped over the ridge, made another 180° turn, and then proceeded down the appropriate valley, as planned.

Colonel Wood's force, much the least experienced of the five participating groups, succeeded in reaching the target area with all the aircraft that had been dispatched. Of the four groups which actually attacked selected targets, its losses were lightest, and it completely destroyed its target.

Red Target Force carried out its attack between 1210 and 1220 hours at altitudes varying from 200 to 700 feet, scoring numerous hits on all four divisions of its target.[37] The bombs were dropped by quick toggle method at 10 to 20 feet intervals. Antiaircraft of light intensity, but accurate, was encountered, as well as machine gun fire. From three to six enemy fighters were seen. Of these, one ME-109 and one ME-110 were destroyed. Four airplanes were lost in action.

A lieutenant of the 389th Group, two days after the mission, wrote of it as follows:

> That was our first low-altitude mission. . . . We came in wide open at house top level with all guns firing. . . . after the bombs were away, we went lower and flew for 40 minutes. In the fields and villages that we passed over people just stood in the streets and villages and waved. Very few people ran for cover.
>
> High altitude bombing is much better. At one hundred feet you see too damn much and besides being hard on your nerves . . . it scares hell out of you. We were in the air 14 hours.[38]

The 98th and 44th Groups, commanded by Col. John R. Kane and Col. Leon W. Johnson, respectively, proceeded from Pitesti to the final IP at Floresti, as prescribed. These groups constituted Target Forces White IV (assigned to the Astra Romana and Unirea

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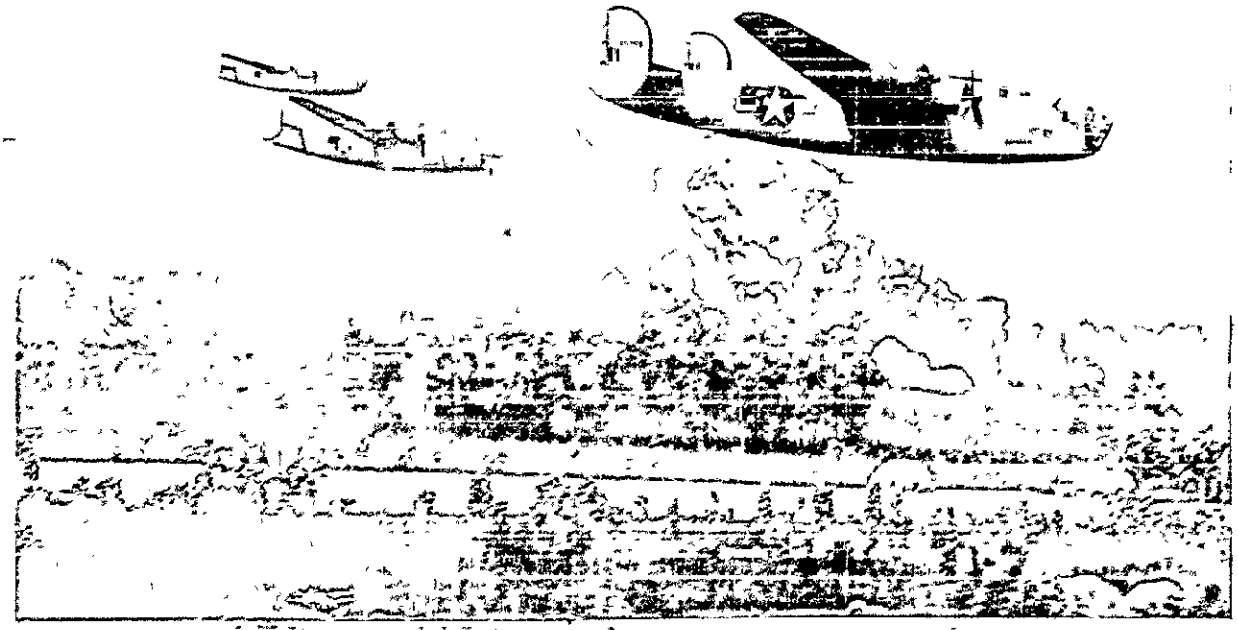
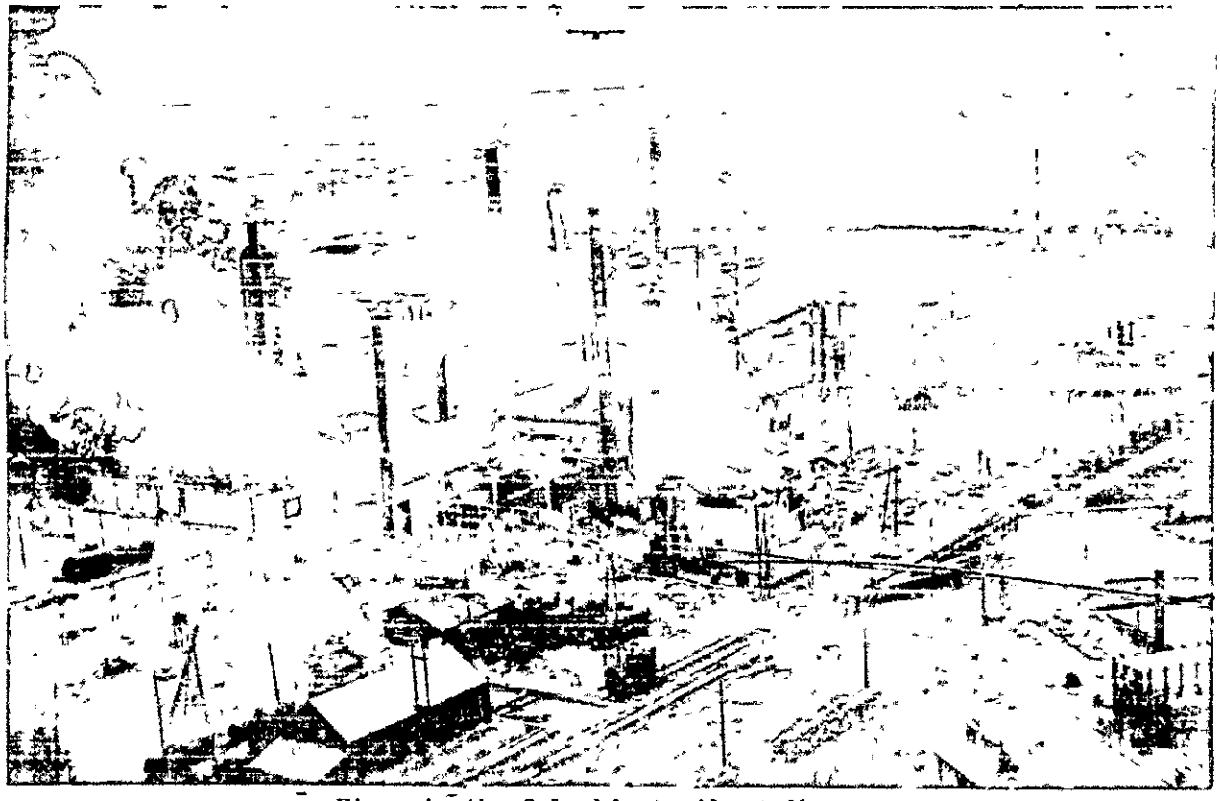


After the Attack the B-24's Hugged the Ground



Fires in the Colombia Aquila Refinery

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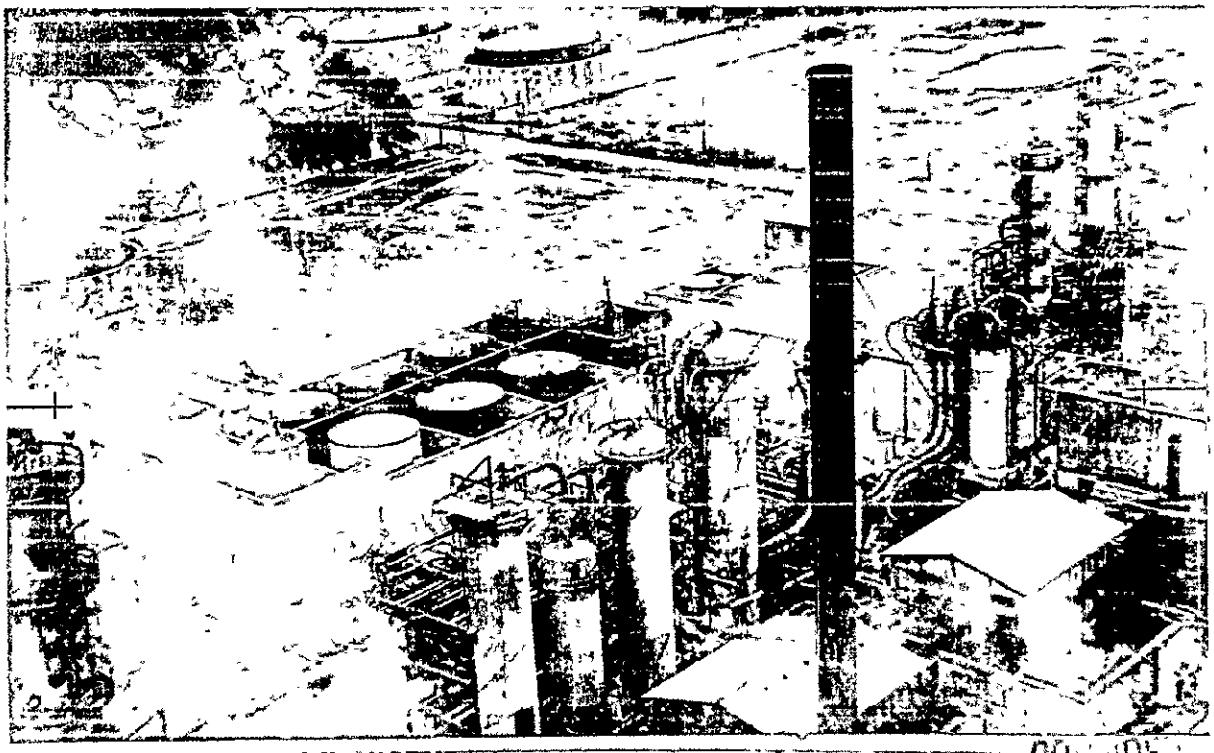
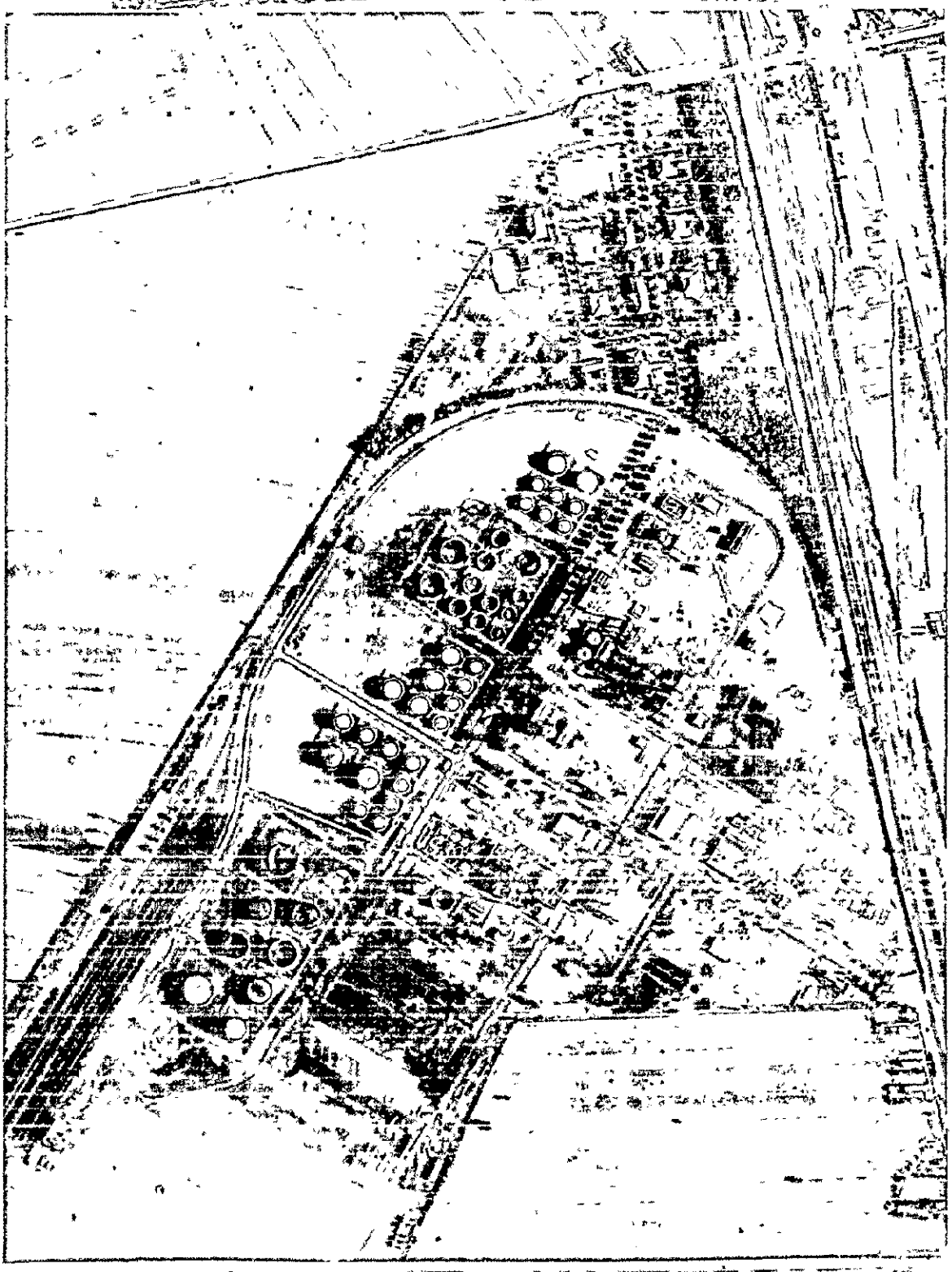
The Astra Romana Refinery under Attack



Distillation Plant of Colombia Aquila Refinery



Reconnaissance Photo of the Creditul-Minier Refinery (Target Blue). Refining Capacity Destroyed Here Was Estimated As Complete and Likely to Remain So for Many Months.

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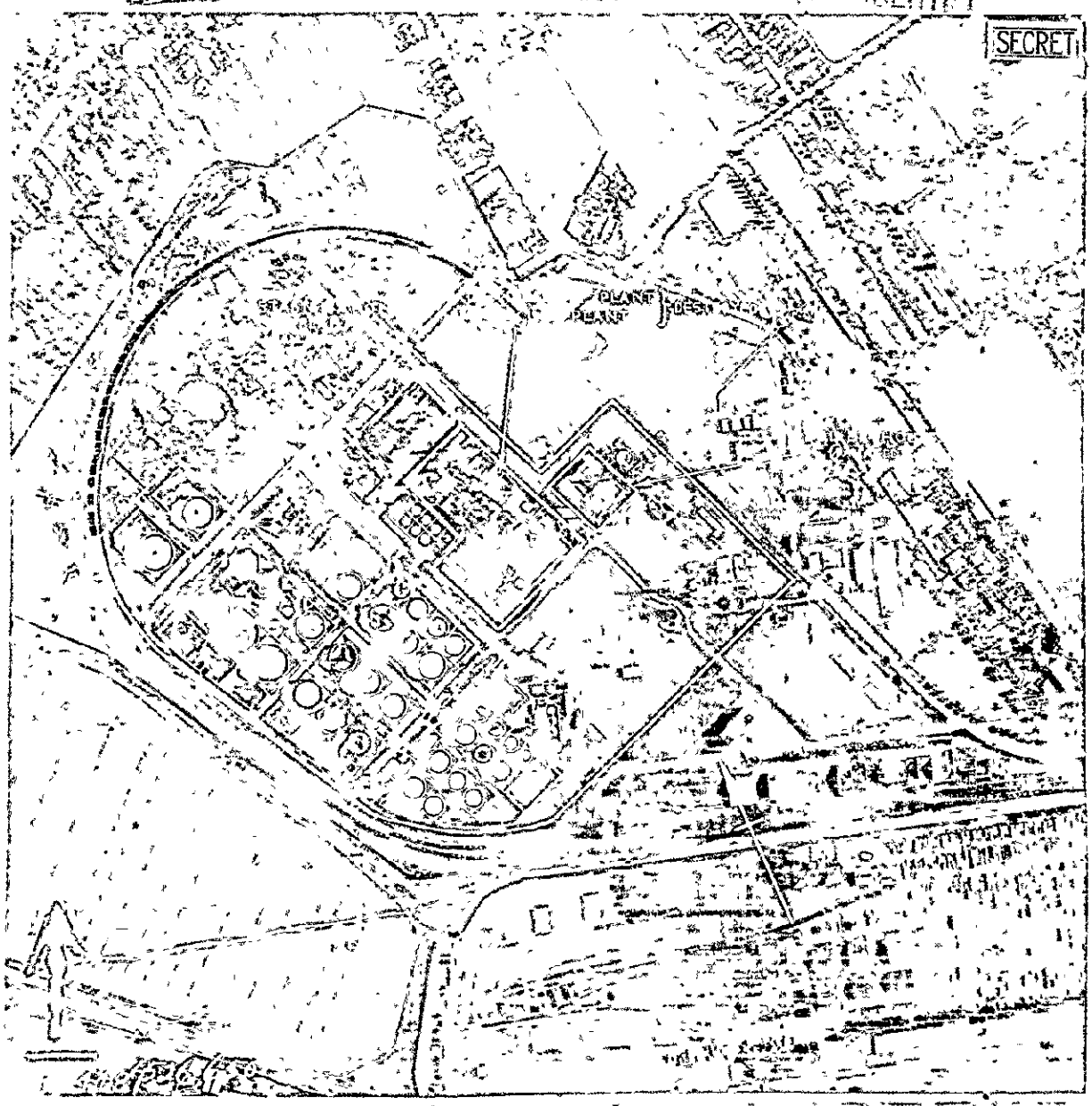
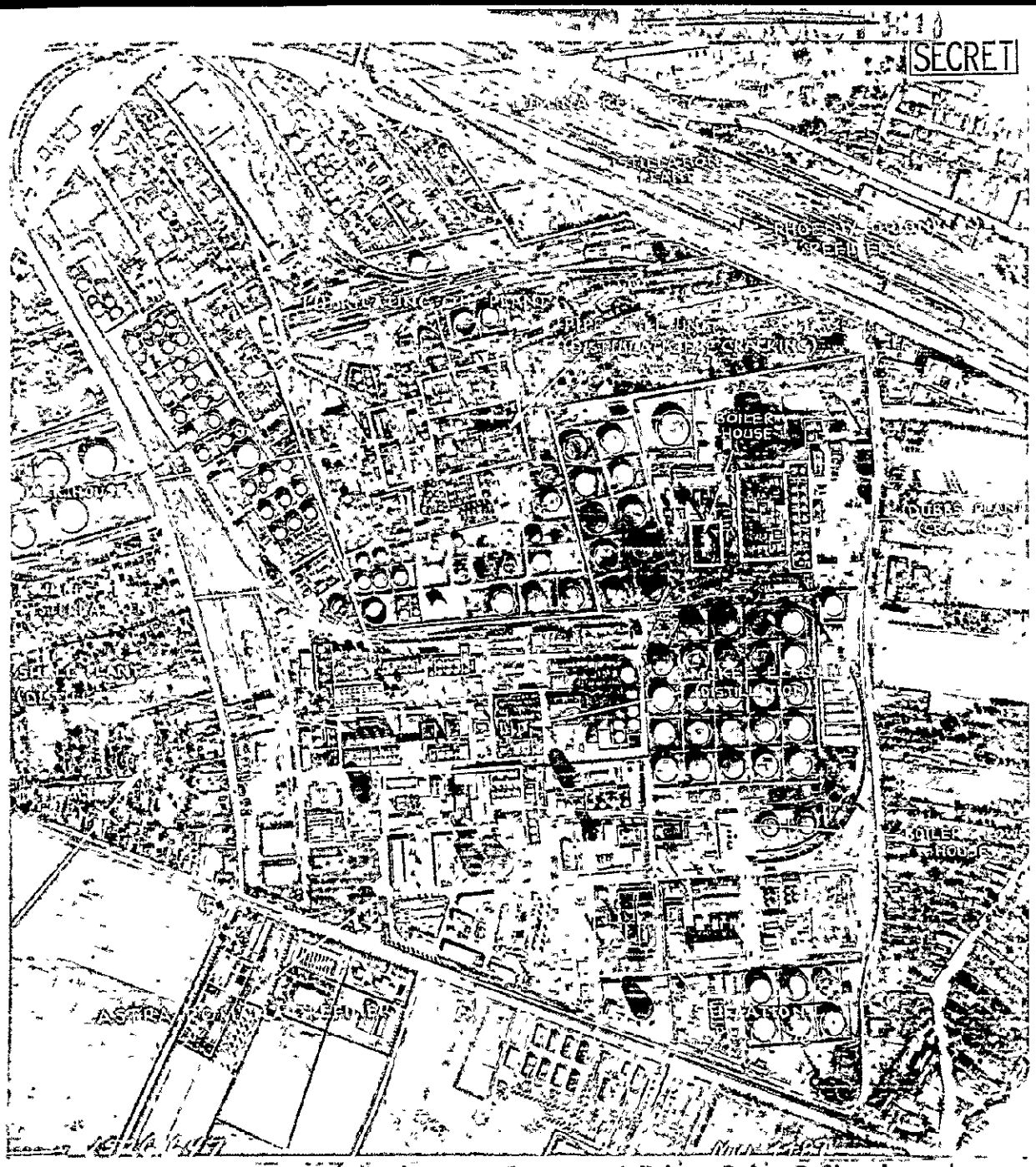
Reconnaissance Photo of the Steaua Romana Refinery (Target Red) Where Destruction of Refining Capacity Was Estimated at 100%.



Reconnaissance Photo of the Colombia Aquila Refinery (Target White V). Plant Damage Here Was So Great That It Was Considered That Almost Complete Rebuilding Would Be Necessary before Operations Could Be Resumed.



Reconnaissance Photo of the Astra Romana and Unirea Orion Refineries (Target White IV). Destruction of Refining Capacity in the Former was Estimated at 50%; in the Latter, at 30%.

Orion refineries), White V (Colombia Aquila), and Blue (Creditul Minier at Brazi). They arrived at the IP just after the 93d Group was finishing its run, after the defenses had been thoroughly alerted. The attacks by the 93d upon targets that had been assigned to these groups had set them on fire and had dropped delayed action bombs which were by this time intermittently exploding, thus greatly increasing the difficulty and danger of the attack.[39]

Instead of turning back, as they might well have done, Colonels Kane and Johnson, without hesitation, led their forces directly against their objectives. For their heroism they were awarded the Congressional Medal of Honor.[40] Their attack was made between 1205 and 1215 hours at altitudes varying from 120 to 250 feet.[41] In the case of Colonel Kane's group, 39 out of the 46 aircraft that successfully took off reached the target area. All 37 of Colonel Johnson's Liberators arrived. The firing of guns and the explosions at the target created a frightful din which made the planes shudder. As the forces flew over, in somewhat tighter formation, at about 200 miles an hour, the flames licked the planes on all sides while the flak beat out a deadly tattoo. The dense black smoke concealed such hazards as towering chimneys and balloon cables. B-24's were seen going down all around. Upon returning home, Colonel Johnson remarked: "It was the closest thing to Dante's inferno I've ever seen."[42] Despite the smoke which tended to obscure the pinpoint targets, the bombing appears to have been surprisingly accurate. Out of one element of six aircraft crossing the target, only one ship came

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safely through. One plane was shot down approaching the target. Just over the target a terrific explosion occurred, destroying three additional ones. A fifth was seen to emerge from the flames, but belly-landed shortly after.[43] Enemy resistance offered these two groups was the heaviest encountered in the whole attack. As one crew member declared, "They hit us with everything but bricks." Some of the heavy guns appeared to be trained in an almost horizontal position. Light flak and machine gun fire were particularly heavy from midway between the IP and the target and several miles beyond. The guns seemed to be so arranged as to keep the aircraft in a crossfire during most of the run-up. Guns were mounted on towers, in pits, concealed in houses, haystacks, woods and growing crops. Numerous balloons were observed scattered throughout the target area. On the way home, the 98th and 44th groups were attacked at several different points by enemy aircraft, including ME-109's and 110's, FW-190's, JU-88's, DO-217's, MC-202's, HE-112's, and 113's, and unidentified biplanes, in short, it seems, "anything that would fly." The first fighter attack was made just after the forces left the target. But, because the B-24's were flying 20 feet or less off the ground, attacking dive bombers were unable to dive on them.[44] Instead, they did lazy eights over them, causing plenty of trouble.[45] Safety was sought in flying a close formation and hugging the ground. Especially vulnerable were stragglers or planes that flew at a higher altitude than others of their formation. An

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especially determined attack was made just off Corfu by 20 or more FW-190's and ME-109's. This was a most unfortunate interception because there were several crippled planes in the formation; also, the formation was scattered because of bad weather conditions.[46] The enemy fighters encountered over the mountains followed the formation out to sea for 15 to 20 minutes, inflicting at least four additional losses. The 98th Group reported at least 50 attacking aircraft, of which it claimed 33 destroyed; the 44th Group, 18 to 20 attacking, and 13 destroyed.[47]

Of the five groups, the 98th sustained the heaviest loss of planes -- 21, 18 of which were brought down in combat. The 44th lost 11, 7 of these in combat and 2 crashing at sea on the return trip.

Numerous acts of courage and resourcefulness on the part of the airmen who flew the Ploesti mission have been recorded.[48] Three officers, in addition to Colonels Kane and Johnson, were awarded the Congressional Medal of Honor for heroic conduct which cost them their lives: Colonel Baker and Major Jerstad, who flew in the same aircraft; and 2d Lt. Lloyd H. Hughes. The cases were practically identical. In each instance the plane was hit by antiaircraft fire short of the target and seriously damaged. Although the pilot might have made a safe landing, he, instead, quite aware of the consequences, piloted his ship over the target, dropping his bombs, then crashed in flames.[49]

In some cases seriously wounded men remained at their posts to perform their duties. Three crewmen of one plane, injured by enemy fire, stuck to their guns until out of danger from enemy pursuit. One of them, severely wounded in the left leg, back and left arm, continued to fire his gun while his wounds were being dressed. Two crewmen of one plane fought a fire in the plane's nose which could not be got at with an extinguisher, even after the bell had rung to bail out. One even took off his parachute to get down to fight the blaze. The fire was put out by tearing out padding and pounding it out. Another member of the same crew went out on the bomb bay with the bomb bay doors open and the bomb bay itself full of hydraulic fluid and gas sprays, and effected desperately needed repairs. When, over the target, the bomb bay doors of another plane jammed, the engineer immediately jumped down from the top turret to crank them open by hand, the radio man replacing him at his post. Although he had never before handled a machine gun in the air, he fired 50 rounds at an approaching ME-109 and brought it down.[50] Another B-24 was hit, receiving a puncture in the bomb bay gas tank. The tank was full of fuel, which was needed for the return trip. The radioman lay down on the cat-walk and held his fingers in the hole until the gas could be transferred into another tank.[51]

The flight plan prepared in advance for the return home from Ploesti was not closely followed. The groups, bombing at different times and in some instances hotly pursued as they left the target area, do not appear to have made any attempt to assemble at Lake

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Balta Potelel to resume route formation as a unified force. Instead, each group or remnant of group, with the exception of the 98th and 44th, which remained together throughout the mission, followed its own course home. Stragglers and small elements attached themselves, whenever possible, to passing formations, for in formation lay a greater degree of security.

In general, the route back was the one prescribed—from Ploesti southwestward to Berkovista, to the southern tip of Corfu, and from thence southward across the Mediterranean to Tocra and finally to Bengasi. Rain was encountered over the Danube valley. In the mountains over Yugoslavia, Albania, and Greece the clouds had thickened and cumulus were piled up to about 30,000 to 40,000 feet. It was possible, however, to fly through in the clear at 15,000 feet by continually bearing to the west.[52]

Sometimes aircraft voluntarily left formations to accompany planes that were in distress. Such planes generally made for Turkey or the nearest Allied landing grounds on the islands of Cyprus, Sicily, or Malta. Altogether, seven planes landed in Turkey and an additional one crashed at sea off the Turkish coast, seven of the crew being rescued. Nineteen landed on Allied fields, other than at the home base. Two crashed at sea on returning from the target. A total of 92 aircraft succeeded in returning direct to Bengasi, thus completing a flight of approximately 2,400 miles[53] after spending from 13 to 14½ hours continuously in the air.

Meanwhile, at the IX Bomber Command base near Bengasi the day dragged on. One by one the 13 turnbacks returned. At about the time the Liberators were expected to reach their targets a meeting of headquarters section heads was called in the War Room.[54] There, for the first time, they were officially told the object of the mission.[55] In the course of the afternoon the letters "MS" came in on the radio, a prearranged signal from General Ent signifying "Mission Successful." Long before the returning B-24's were due, most of the restless staff scattered to the various landing fields to greet their return. Among those anxiously waiting was General Brereton himself. The atmosphere grew tense at 1700 hours, the estimated time of their arrival, approached and passed with no returning Liberators as yet in sight. The first planes landed at 1720 hours, just as the sun was setting. Before long, the sky was dotted with planes coming in singly or in small groups, landing on their respective fields. Some dispensed with all formalities, cutting in directly, their fuel gauges registering empty. One plane that landed had actually consumed its final drop of gasoline and had to be towed off to the taxi strip. Virtually all that returned that night were back by 1810 hours, before darkness really fell. By midnight, approximately 70 remained to be accounted for. At 0200 hours on 2 August, General Brereton and General Ent went on the air to give an account of the climatic event in the history of the Ninth Air Force in the Middle East. Meanwhile, the strike photos of the

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mission were being developed and were available for inspection by the next morning. These recorded almost every phase of the mission, constituting a vivid and unforgettable picture of the event.

Aircraft losses resulting from the Ploesti mission were high, totaling 54.[56] Forty-one of these were brought down in action; five were lost due to operational causes; seven landed in Turkey, and one landed in the sea just off the Turkish coast. Besides the 13 that turned back short of the target, 89 succeeded in returning directly to the home base. Twenty-two landed at alternate bases either to refuel or because of engine trouble or battle damage and subsequently found their way back to Bengasi. Of the 111 returning from the target area, approximately 53 were classified as damaged.

Antiaircraft gunfire was the principal cause of losses. The bomb bay fuel tanks were a contributing factor of great importance, the Liberator's Achilles heel, aimed at by enemy artillerymen. There can be no doubt that had all bomb bay tanks been emptied and dropped before reaching the target area, losses would have been smaller. Colonel Kane was of the opinion that many of the losses were due to the fact that rear elements of attacking formations making their runs flew higher than planned and practiced, thus exposing themselves unduly to enemy fire. Enemy fighters accounted for a few American losses, but in general they were not very formidable. Other losses were occasioned by ground explosions of gasoline storage tanks and cars, by delayed action bombs, by collisions of airplanes with other aircraft, and by contact with obscured chimneys and balloon cables.[57]

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It is as yet impossible to state exactly the number of casualties suffered by the Ninth Air Force in this attack. Manning the 177 airplanes that successfully took off were 1,726 officers and enlisted men. The crews of the 53 ships successfully taking off but failing to return numbered 532. Ten crewmen were saved when they crash-landed at an alternate base; seven were rescued at sea, and 75 interned in Turkey. Approximately 110 have been reported as prisoners of war in Rumania, of whom many are known to have been wounded and hospitalized there. A total of 330 men remain unaccounted for. It appears altogether likely, however, that some of these missing men are alive in Axis Europe. Several Liberators are believed to have made forced landings in Bulgaria but the number of survivors, if any, is unknown. On the other hand, a number of the crewmen who returned were seriously wounded, some subsequently dying.

The view of the men who participated in the Ploesti mission, after their return, has been well expressed by Capt. R. L. Lebrecht of the 98th Bombardment Group, as follows:

> Those of us who returned of course were happy to be back, and although great losses were suffered on this mission we felt that inasmuch as it was such an important target we were glad to make it, and glad too, that no greater losses had been sustained.[58]

Concerning the mission, Air Chief Marshal Tedder sent the following message to General Brereton:

> I wish to express my deep admiration for the magnificent manner in which the Ninth Bomber Command carried out their great task of striking the very heart of the enemy's war capacity. I was immensely impressed through the way plans were prepared and training completed. The gallantry and determination with which the attacks were

pressed home are beyond all praise and will be an inspiration to all Allied air forces. A big job, magnificently done.[59]

General Arnold, Commanding General of the Army Air Forces, expressed himself to General Brereton in the following terms: ". . . your preparation and training for Tidal Wave satisfactorily bore fruit and we all are immensely proud of the showing you made. The impression prevails that Tidal Wave dealt a blow that will contribute materially to the defeat of the Axis."[60]

CHAPTER V

CONCLUSION

An exact appraisal of the damage done to the Rumanian oil refineries by the attack of 1 August 1943 is not possible at the present time. That, it seems, must await Allied occupation. In view of the absence of reports of unquestionable reliability by qualified ground observers, knowledge of the extent of the destruction wrought is largely dependent upon combat or strike photographs taken in the heat of the attack and aerial reconnaissance or stereo photographs taken some time later. With due regard for the efficacy of photo reconnaissance, the possibility of a considerable margin of error must be admitted.

The Ploesti mission produced a fine lot of oblique strike photographs taken at minimum level. While of great value as a source of information concerning enemy defenses, these do not, however, constitute an adequate basis for damage assessment. They show, here and there, a hole in a roof where a delayed action bomb had penetrated, the starting of fires, or even results of explosions, but generally these photographs were taken too early to indicate the degree of the attack's success. Photo reconnaissance gives a much clearer verdict. Two reconnaissance missions were flown within three weeks after the attack; the first on 3 August, the latter on 19 August, resulting in a set of excellent vertical photographs. On the former mission only the Ploesti area proper and a part of Brazi were photographed; on the second, Campina, Brazi, and Ploesti.[1]

Only one type of reconnaissance plane was capable of attempting the flight—the fairly new British Mosquito. Prior to the mounting of TIDAL WAVE, two of these aircraft were sent out from Great Britain to do this job.[2] Because of motor trouble, however, only one was available for the mission of 3 August.[3] The length of the flight was almost too much for it, and the pilot, worried about his fuel supply, was able to effect only a partial coverage of the bombed areas. He succeeded in reaching the Bengasi base just as his gasoline supply was exhausted. On 19 August the second mission was carried out. This time the areas left unphotographed by the first were photographed. The pictures, taken at 27,000 to 28,000 feet, were of excellent scale and quality. They were turned over to the Middle East Interpretation Unit, which, in collaboration with Colonel Forster and other refinery experts, issued a series of Photographic Interpretation Reports, which are the principal source of Allied intelligence on the effectiveness of the attack of 1 August 1943.

In general, the evidence indicated that the targets that were bombed were bombed accurately, but that many of the bombs did not explode. Therefore, the damage was not as great as had been expected. Nevertheless, a "high degree of short-term damage" and a "promising degree of long-term damage" was discovered.[4]

The Romana Americana refinery (Target White I) was not bombed at all.

Concordia Vega (Target White II) suffered but slight damage, one distillation plant and an asphalt plant only being fairly hard hit.

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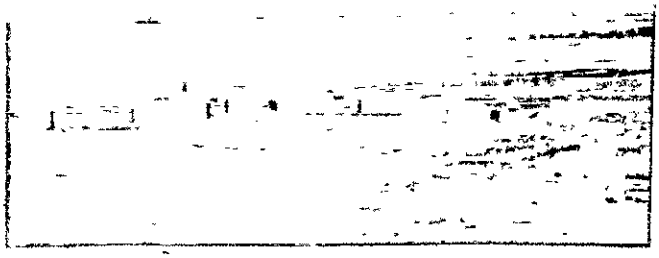
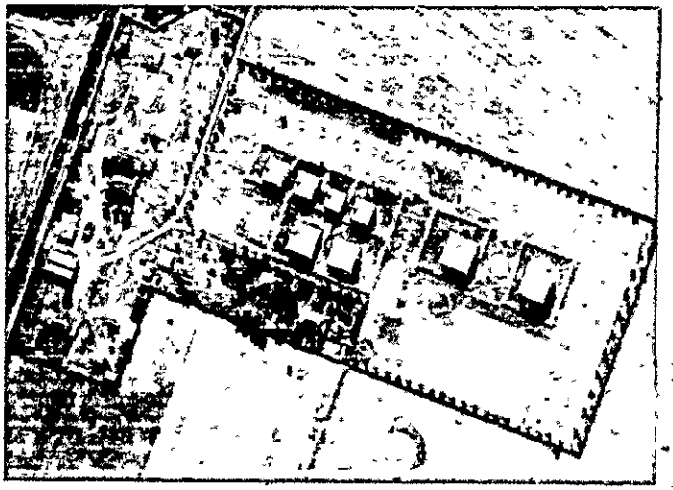
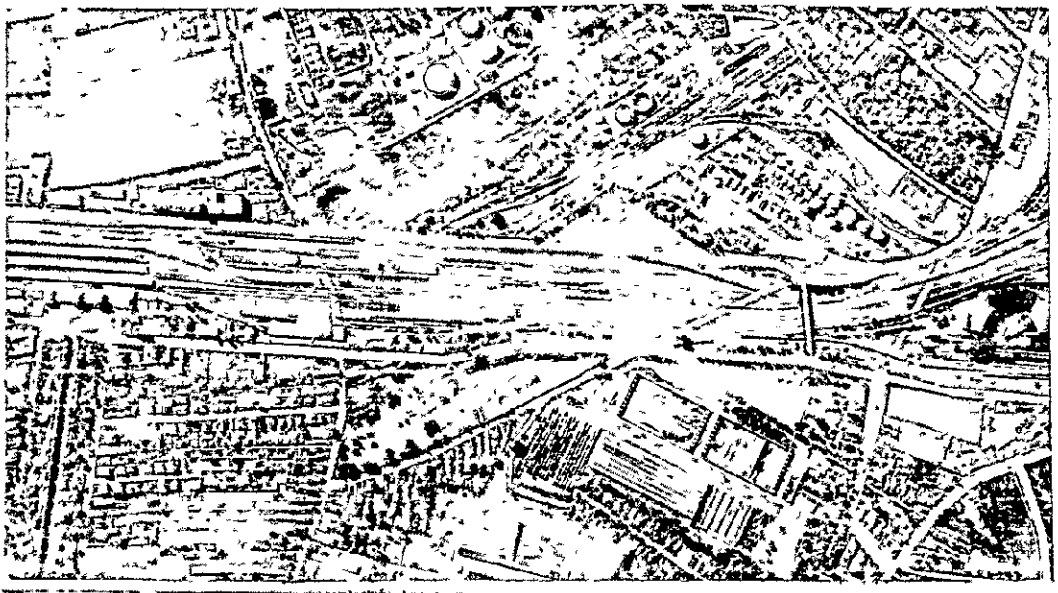


Dummy Oil Installation Intended as a Decoy for Night Bombers



Pumping Station for Giurgiu Pipe Line Disguised So As to Give the Impression of a Small Housing Estate



Ploesti South Railway Station Camouflaged. White Dummy Roads Painted across Railway Lines and Marshalling Yards. Station Building Split up by a Pattern Intended to Resemble Rows of Houses.

Its capacity was reduced perhaps no more than 15 per cent. It was not considered that the plant would be out of action for any great length of time.

Standard Petrol Block and Unirea Speranta (Target White III) sustained no appreciable damage.

Target White IV was much more heavily damaged than the foregoing. The most importantdistillation plant of Astra Romana was completely demolished. This refinery as a whole, however, was expected to resume operations fairly soon at about 50 per cent of its original capacity, since other vital installations had come through in most cases without serious damage. While the distillation plant of the Unirea Orion refinery appeared to be unhit, the main boiler was wrecked, which, it was estimated, would reduce the capacity of the refinery by about 30 per cent.

The Colombia Aquila refinery (Target White V) was very badly damaged in its vital installations by fire and explosion, so badly, in fact, that it was believed it could not be made operable in less than six months, and it was even doubted that the Nazis would attempt to repair it.

The Steaua Romana at Campina (Target Red) was extremely hard hit in most of its vital installations, with the result that not only was it put out of action, but it was estimated that it would be many months before it could function again.

Equally decisive was the damage inflicted upon the Creditul Minier refinery at Brazi, which was held certain to remain inactive for some months.

An estimated 42 per cent of the total refinery capacity of Rumania's nine leading refineries was destroyed.[5] Possibly 40 per cent of the cracking capacity had been knocked out for a period of at least four to six months. It should be added that in the attack Rumania's only paraffin wax plant was destroyed and her facilities for producing lubricating oils were considerably reduced.

Many reports, official as well as unofficial, came out of Rumania following the attack. While these vary widely, they agree on the very serious damage done. The most interesting and one of the most reliable of these reports was that submitted by the Turkish minister in Bucharest to the Turkish Foreign Minister and transmitted to the United States Ambassador to Turkey in strictest confidence.[6] The report was based on a personal visit to the bombed areas and conversations with two Rumanian cabinet members and the general managers of two refineries who had just left a meeting of refinery managers at Ploesti. According to this report, fires continued to rage at Ploesti, Brazi, and Campina on 3 August, and even that late new fires were being started by delayed action bombs. Fire-fighting apparatus was of little avail because of lack of water. In addition to confirming substantially the Photographic Interpretation Reports, the Turkish mihister reported the obliteration of a train of munitions and a complete train of loaded tank cars. The damage to the production facilities of all refineries was estimated at 70 per cent.[7] The managers were reported to have agreed to send crude oil from seriously damaged properties to those less seriously

damaged, which were to operate at full blast. Surplus crude oil was to be sent to Germany and Czechoslovakia for refining, in so far as transportation and refining facilities permitted. According to the report, governmental and refinery officials were "stupefied" by the precision of execution of the attack which was described as "superb," especially because of having scarcely touched the city of Ploesti. One high Rumanian official is quoted as remarking that "the Americans delivered their bombs on the refineries as precisely as a postman delivers his letters and the accuracy was beyond belief."

On 6 September 1943, the Target Information Branch, Operational Division, AC/AS, Intelligence, called a meeting of all interested agencies in Washington for the purpose of reaching a common agreement in evaluating the damage inflicted on the Rumanian refineries by the 1 August attack. Present at the meeting were 21 experts representing nine different organizations, domestic and foreign, including the Office of Economic Warfare, Office of Strategic Services, Petroleum Administration for War, Military Intelligence Service, and the Informational and Operational Divisionsof AC/AS, Intelligence. A report embracing the views of all present at the meeting was drafted and adopted, without dissent.[8] Long-term damage to Rumanian refining capacity was assessed at 42.5 per cent. The following excerpts from the report summarize very well the principal conclusions of the meeting:

> As a result of the raid, Rumanian refinery capacity has been reduced from 9,235,000 tons per year to 5,300,000 tons per year. Rumanian crude oil production is currently estimated by the Enemy Oil Committee at 5,100,000 tons/year, and by the British Hartley Committee at about 5,500,000 tons/year. It follows, therefore, that for six months from 1 August 1943 Rumanian refinery capacity will just suffice, or be slightly inadequate, to handle crude oil production. Thus, the most important effect of the raid was to eliminate the cushion between production and capacity.
>
> . . . . . .
>
> From the overall standpoint, therefore, the attack of 1 August 1943 destroyed the bulk of the cushion formed by the excess of efficiently located refinery capacity over crude oil production. The Axis must endeavor immediately to rebuild this cushion through rehabilitation of the damaged refineries or the construction of equivalent new capacity in equally suitable locations. Pending such rehabilitation, which will require at least six months, the balance between crude oil supply and efficient refinery capacity will be so close that any considerable damage inflicted on operating refineries will be reflected by the immediate loss of product output or in a severe strain on other phases of the Axis economy.[9]

Despite the fact that the Ploesti mission resulted in very important damage to the Rumanian oil refineries, this damage was not sufficient to be decisive. Save for temporary shortages, the attack did not result in any major loss of petroleum products for the Germans because they were able to make up for lost refining capacity by activating idle refinery capacity at Ploesti and by speedily repairing some of the damaged plants. It was even believed that if no further attack were launched, the cushion of excess refining capacity would be restored by April 1944. However, there is no doubt but that Germany's oil position became tighter in 1943. At the opening of 1944 supply and requirements were substantially in

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balance. The oil reserve was believed to be at a bare minimum. The combination of high military requirements, delayed completion of increased synthetic oil plant capacity, and bomb damage to existing refineries, all prevented the Nazis from building up their stocks. Therefore, Germany's oil position following the Ploesti attack appeared peculiarly vulnerable to further attacks.

The degree of destruction resulting from the attack fell considerably short of the hopes of its planners. Throughout the planning the possibility of subsequent missions had been envisaged. Prior to the attack, General Eisenhower had cabled to General Marshall as follows:

> Both Tedder and Spaatz are of the conviction that we must carry out more than 1 attack in the Tidalwave operation. They feel that if we should fail to follow up, we will probably lose much of the value of the first attack. Their conclusion is that the attacks should be continued, assuming reasonable success in the first one, until our experts state that from 60 to 70 per cent destruction has been accomplished in the target area. . . .[10]

After 1 August the dispatch of additional missions seemed to be the logical course. This was especially true after the conquest of southern Italy placed under Allied control numerous excellent airdromes situated less than 600 miles distant from the Rumanian oil district.

Shortly after the Ploesti mission, General Eisenhower, in emphasizing the importance of gaining early possession of southern Italy, used the argument that "once we are established in Italy, follow-up attacks on Tidal Wave will from every point of view be

easier to carry out than they now are from African bases."[11] About the same time, Col. Joe L. Loutzenheiser, then Chief of the Strategical Plans Division, advocated aerial bombardment of oil refineries in northern Italy, southern France, and Hungary, as well as railway targets connecting these targets with the Ploesti area. "Without the destruction of the above mentioned targets," he declared, "the Ploesti job is only half done."[12] About a month later Maj. John M. Wisdom, Executive, Target Information Branch, Operational Division, AC/AS, Intelligence, recommended to General Sorensen that the Ploesti refining area be attacked again, as soon as possible.[13]

The project of Soviet aerial bombardment was, meanwhile, revived by the Joint Chiefs of Staff.[14] Action on this matter by the Combined Chiefs of Staff had been deferred because of the disinclination of the British Chiefs of Staff to make this request of the hard-pressed Russians. It was now felt by the CCS that the improved general situation of the war in Europe warranted action.[15] A memorandum to President Roosevelt and Prime Minister Churchill was adopted, which recommended the following message to Marshal Stalin:

> Following the recent successful attack by U. S. bombers on the Rumanian oil refineries at Ploesti, further attacks by United Nations bombers are highly desirable to insure complete destruction and preclude repair of the damage to this vital objective. We suggest that when the situation permits you consider the possibility of sending Red air force bombers from Soviet bases to attack this objective. If you should consider this operation favorably, we shall be glad to advance detailed intelligence material relating to the targets.[16]

It is not known whether or not such a message was sent.

The fact that no subsequent attacks were made against the Rumanian oil refineries by Allied air forces until April 1944 is explainable on the grounds that tactical operations and strategic targets of greater priority claimed first attention.

Although the Ploesti area was strongly defended, the defenders had been caught off guard. There is no room for doubt that had it not been for accidents and mistakes made by the attacking force, the damage inflicted would have been far greater and losses much less severe. According to reports that came out of Rumania, the Germans blamed the Rumanian commanders for laxness, and upon order from Berlin the entire region was surrounded by the military and several commanders were severely questioned.[17] It also appears that shortly after the attack the defenses were considerably strengthened by sending hundreds of additional fighter planes there and increasing the number of barrage balloons.[18] The Rumanians were highly appreciative of the fact that the bombing had not been promiscuous, but, instead, confined strictly to military targets which had minimized casualties among the civilian population and damage to private property.[19] Both Rumanians and Hungarians appear to have been profoundly impressed by the attack on Rome, the Ploesti mission, and the one that followed about two weeks later against Wiener-Neustadt. Pro-Allied sentiment in these countries seems to have increased as nervousness developed and loyalty to Axis ties declined. Leland Harrison, United States Minister to Switzerland, reported "increasing fear among enemies and respect among neutrals" for the AAF. "Such spectacular accomplishments [as the Ploesti mission]," he cabled,

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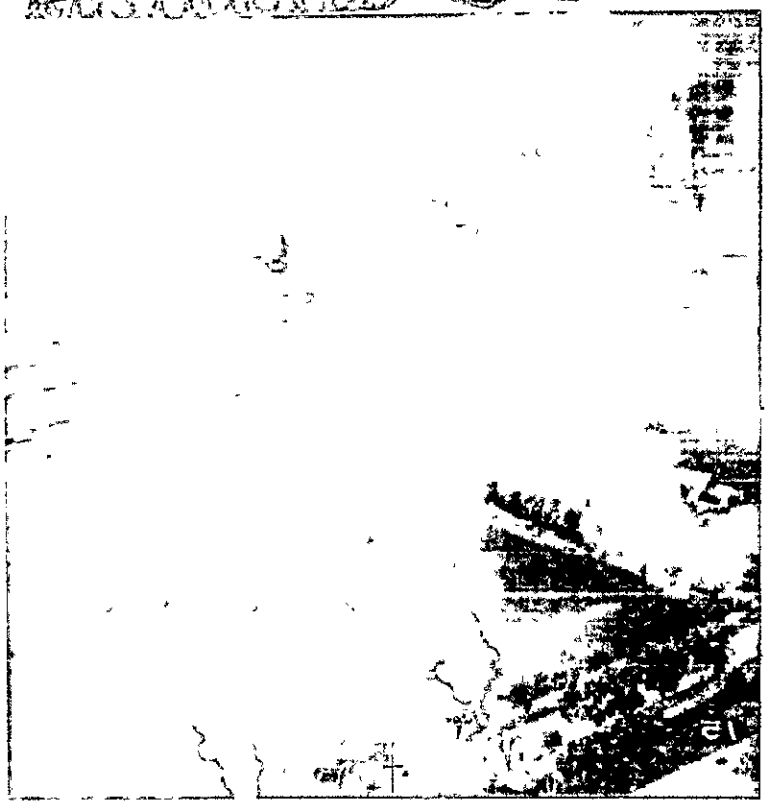

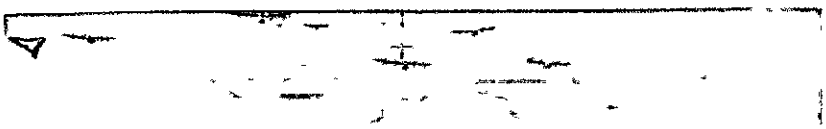

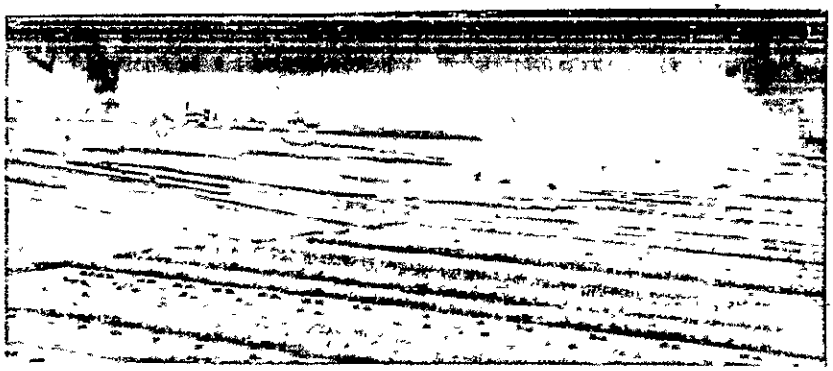

Smoke Screens Were Not Nearly As Effective As Smoke from Burning Refineries and Tanks

"proving important influence morale adding greatly to already high prestige American Air Force."[20]

Prior to the Ploesti mission the feeling existed that intelligence concerning the target was inadequate and out of date. This was found to be the case. As a result of personal observation and the photographing of the Ploesti area during and following the attack, a great deal of accurate data was secured concerning the defenses of the region.[21]

Much of the camouflage employed was found to be little better than "a poor paint job." None of it was very effective against a minimum-altitude, daylight attack. However, certain skillful attempts at camouflage were noted. The tanks of the pumping station for the Giurgiu pipe line, for example, were covered with dummy pitched roofs and chimneys to give the impression of a group of small houses. Nevertheless, the tanks still cast circular shadows and their round shape was still discernible. The South Railway Station at Ploesti was camouflaged by painting white dummy roads across the railway lines and marshalling yards. At the same time, the roof surfaces of station buildings were split up by a pattern intended to resemble rows of houses.

Dummy oil installations were found a few miles to the southeast of Ploesti, consisting of about 33 oil storage tanks, 20 by 30 feet in diameter, but only one to one and a half feet high, two dummy cooling towers 15 to 20 feet high, and about eight dummy oil derricks. Suggestions of a remotely controlled system of lighting or firing the dummy were noted, indicating that it was intended as a decoy for

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night bombers only. A second dummy installation reported seen northwest of Ploesti was not photographed.

A smoke screen was employed during the attack, but it was very ineffectual. The thick black smoke which rose from burning refineries, however, proved to be a real handicap to the attacking force. Smudge pots were located south, northwest, and northeast of Ploesti, and in the vicinity of Brazi.

The position of 23 barrage balloons was plotted in the target area, the greatest concentration being northeast and east of Ploesti. Although down at first, the balloons were raised before the attack was well under way; yet, curiously enough, not a single one appears in the strike photographs brought back from the mission. While several aircraft are known to have been lost as a result of hitting balloon cables, six returned to Allied bases bearing the marks of such encounters.

It came as no surprise to the striking force to find Ploesti heavily defended by artillery. Besides rifles and machine guns, antiaircraft of 20-, 40-, and 88-mm. were employed by the defenders. Fifty-two heavy antiaircraft guns of varying types and calibres were noted in 10 positions encircling the city. Several of these heavy guns were equipped with Würzburg RDF control. Approximately 125 light antiaircraft guns, many mounted on flak towers in groups of three, were observed, and seven searchlights were located in the region. Machine guns were scattered all over the area, their positions generally being well camouflaged.

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Reconnaissance Photo of Enemy Gun Positions

Strike Photo of the Control Center of a Heavy A/A Position

Enemy single- and twin-engine fighters were encountered around the target and en route home in considerable numbers. Intelligence estimated the figure at approximately 90; some, however, were of obsolete types. A majority appear to have been manned by Rumanians, rather than by Germans. Although the 98th and the 44th Groups ran into some determined interference, the defending aircraft were, in general, not very effective.[22] Relatively few aircraft casualties were attributed to enemy fighters. Liberator crews, on the other hand, made the astonishing claim of having brought down approximately 50 enemy aircraft![23]

Decorations were liberally awarded to the men who participated in the Ploesti attack.[24] Out of the 17 awards of the Congressional Medal of Honor to Army airmen from Pearl Harbor down to 11 March 1944, five went to officers for roles played in the Ploesti attack. They are Col. Leon W. Johnson, commander of the 44th Group; Col. John R. Kane, commander of the 98th Group; Lt. Col. Addison E. Baker, commander of the 93d Group; Maj. John L. Jerstad; and 2d Lt. Lloyd H. Hughes.[25] Fifty-six were awarded the Distinguished Service Cross, including the following: Brig. Gen. Uzal G. Ent, commander of the IX Bomber Command; Col. Keith K. Compton, commander of the 376th Group; Col. Jack W. Wood, commander of the 389th Group; Lt. Col. James T. Posey, commander of Blue Target Force; and Maj. Norman C. Appold. The Silver Star went to 41, while one received the Bronze Oak Leaf Cluster to the Silver Star. One hundred and thirty-six were awarded the Bronze Oak Leaf Cluster to the Distinguished Flying Cross, while the latter decoration was received by 1320. One

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Soldier's Medal was awarded.

To Col. Jacob E. Smart went the Distinguished Service Medal, while Lt. Col. W. L. Forster, Maj. Gerald K. Geerlings, G/C D. G. Lewis, and W/C J. S. Streeter were awarded the Legion of Merit. All bombardment groups that carried out the attack received citations.

Following the Ploesti mission, approximately 110 American airmen were prisoners of war in Rumania. More than half of this number were injured through bailing out at low altitude and were hospitalized. When the Germans demanded that they be handed over to them the Rumanians declined to comply.[26] In view of the fact that Rumania was at war with the United States, that Rumanian soldiers and airmen had cooperated with the Germans in defending the oil refineries, and that Rumanian life and property had been destroyed in the attack, the treatment of the American prisoners by the Rumanians, especially by those socially prominent, is most remarkable. Indeed, the welcome given them was so extravagant as to suggest a demonstration against the Nazis. The following statements of prisoners are typical, reflecting their attitude toward their captors: "We are what is commonly called prisoners of war. You would never know it from the way they treat us though"; ". . . the Rumanians are extremely kind people and are doing all they can to make us happy"; "We have all the comforts of home;" ". . . it is more like a vacation. They are treating us swell and we couldn't ask for anything better"; "Rumanian people treating us Americans

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wonderful. Nothing too good for us, food is fine"; ". . . we're being treated like royalty."[27] In fact, King Michael and the Queen Mother visited the prisoners, subsequently sending them books, cookies, cigarettes, and other comforts. Rumanian ladies' committees in Bucharest were untiring in their efforts to show a "non-partisan spirit," collecting and sending gifts to the wounded Americans and Rumanians alike. While some regarded these actions as exemplary, the pro-Axis minority complained that it was ridiculous to see enemy airmen receiving better treatment than the soldiers in the Rumanian army.[28]

As a result of forced landings or crashes, the crews of eight aircraft, totaling 75 men, were interned in Turkey. In the case of seven survivors of a crew whose plane had crashed in the sea off the Turkish coast, the "cooperating neutral" government of Turkey, stretching international law a point, accepted the validity of the argument that these men were "shipwrecked mariners" and promptly released them.[29] The Turkish Foreign Minister was reported to be instructing the General Staff not to take exceptional measures to prevent the escape of the remaining internees. However, he "requested that he be not embarrassed by too many escapes in the immediate future."[30] A system of priority of "escapes" was established. Meanwhile, the Turkish authorities were following the liberal policy of allowing the internees to absent themselves from places of internment on their word to return.[31]

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Originally, the 44th, 93d, and 389th Groups were borrowed from the Eighth Air Force expressly for participation in the Sicilian campaign and the TIDAL WAVE project. Before TIDAL WAVE was mounted, however, it was decided that they should collaborate with the 98th and 376th in an attack on Nazi aircraft plants at Wiener-Neustadt, Austria, immediately after which they were to be returned to England.[32] The Wiener-Neustadt mission, less spectacular than the one against Ploesti, yet almost as difficult, did not take place until 13 August. Meanwhile, the time was spent in repairing the aircraft damaged in the recent attack and allowing the personnel to recover from the slump that inevitably followed such a difficult and costly mission. Morale quickly improved, while large numbers of mechanics toiled in the heat and dust of the desert to make the heavy bombers serviceable for the forthcoming attack. Even before the Wiener-Neustadt attack took place, General Eisenhower proposed, in view of the critical situation in Italy, that the force which had carried out the Ploesti mission and was about to attack the Austrian target should, immediately thereafter, be concentrated on targets in Italy.[33] General Brereton, asked whether he considered the Wiener-Neustadt and Ploesti missions sufficiently accomplished to release the three B-24 groups for return to their bases in the United Kingdom, replied in the negative.[34] Meanwhile, the Ninth Air Force was following a Mediterranean Air Command directive to attack targets in Italy. Nevertheless, on 22 August 1943, the three Eighth Air Force groups were relieved of

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their assignment to the IX Bomber Command and soon thereafter returned to their home stations.[35]

Had the Ploesti mission been executed as planned, it very probably would have attained the degree of success that its planners expected of it, which was the destruction of 90 per cent of the refining capacity of the Rumanian oil industry. At the same time, combat losses would have been minimized. But for an unfortunate accident of bad weather conditions, resulting in the loss of formation unity, and an even more important error of judgment, there is every reason to believe that complete surprise would have been achieved. This loss of unity might have been repaired at the risk of sacrificing surprise, had radio silence been broken to reassemble the formation at the Danube. Had this been done the success would probably have been greater and the losses less severe than was actually the case. "Combined operations of this nature, require precision and timing, and are most difficult to control and coordinate especially when navigation must be conducted over great distances."[36] The error in mistaking Targoviste for the final IP resulted in a sacrifice in large degree of the benefits of training and briefing for the attack in the cases of the 376th and 93d Groups. It also deprived the others of the advantage of surprise, for by the time the 14-minute run was completed from Bucharest to Ploesti, the targets had been alerted. In this connection it is notable that the losses suffered by the 93d Group were heavier than those of the 44th. If it could be assumed that without the separation of the groups

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the 98th and 44th Groups would have followed the leading element off course, the loss of unity might be considered a fortunate accident. However, it should be remembered that the commanders of these groups were highly skilled, experienced fliers who might well have recognized the error and taken timely steps to rectify it. The decision of the commander of the 93d Group to attack from the south, after his formation got off course, was unsound. Not only were targets bombed that were not assigned to this group, for which it had received no training and briefing, but it rendered much more dangerous the task of the assigned forces.

To point out errors, however, is not to assess blame. One is not inclined to take issue with General Brereton's well balanced view of the matter when he stated:

> no blame is attached to any commander or leader participating in the mission, for decisions which were made on the spot under the stress of combat. On the other hand, the IX Bomber Command is deserving of the highest praise for its excellent staff procedure and leadership displayed in the planning, training and execution of this most difficult mission.[37]

Colonel Smart, as deeply interested in the success of the mission as any man, expressed the following view of the outcome:

> regardless of how good, how detailed your plan may be, there is a human element to be considered. It is easy for football fans to sit back on Monday morning, play quarterback and decide that if this man had done this, something else would have happened. It is easy to criticize work done by someone at some place a great distance away. Human error will happen in any maneuver.[38]

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NOTES

Chapter I

1. Karl Brandt, "Germany's Vulnerable Spot: Transportation," in Foreign Affairs, XXI, No. 2 (Jan. 1943), 234.

2. Ray Brock, "Output and Value of Rumanian Refineries Discussed," in New York Times, 24 Oct. 1942.

3. David Anderson, "Strategy Reverts to Oil," in New York Times, 8 Aug. 1943; AFMBI Study, "Oil Installations within Bombing Range of Italian Bases," 5 Oct. 1943, AFMBI Exec. files, 373.11; Minutes of the meeting of the Enemy Oil Intell. Comm., Ministry of Economic Warfare, 25 Jan. 1943; European Axis Subcomm., Petroleum Administration for War , Rpt., "The Western Axis Oil Position, as of 31 May 1943," by Enemy Oil Comm.; Paraphrase of msg. to Sec. of State from Harrison (Berne), 13 Jan. 1943. The last three references above were found in the Rumanian Oil Refineries Target Information Folder, AC/AS, Intell., Operational Div., Target Info. Br. [AFIOP Target Information Folder].

4. Office of Strategic Services, Roumania, Dissemination XA-12330, "Further Results of the Ploesti Raid," 27 Aug. 1943, distributed, 6 Oct. 1943; also, High Command, Bur. of the Services de Renseignements and Services de Securite Militaire, 8 Sep. 1943, 9th AF Evaluations (1943), AC/AS, Intell., Informational Div., Record Br.

5. Rpt. on Rumanian Oil, 11 June 1943, prepared by Maj. Dudley J. Scholten, JICME, extr. from Political Intell. Center ME Non-operational Summ., No. 2, 1 June 1943 [Scholten Rpt.] in AFIOP Target Information Folder.

6. General Rpt. on Roumanian Situation as of October 1941, by Paul W. Lambright, New York, N.Y., 24 Apr. 1942 [Lambright Rpt.], in ibid.

7. Summary of the Petroleum Industry in the Ploesti Region, Rumania, Target Folder for Ploesti, recd. by AC/AS, Intell., Historical Div., from 9th AF.

8. Air Objective Folder No. 69.1, Ploesti Area Rumania, Intell. Service AAF, 15 Oct. 1942; also, memo for CGAAF, "Strategic Targets within Range of Middle East Air Bases," sgd. by Col. H. A. Craig, GSC, AC/AS, Plans, 15 May 1942, AC/AS, Plans, Off. Services Br., W.P. III C-6.

9. OSS, Roumania, Dissemination XA-12330; also, High Command, Bureau of the Services de Renseignements and Services de Securite Militaire, 8 Sep. 1943, 9th AF Evaluations (1943), AFINF Rec. Br.

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10. Air Objective Folder No. 69.1, Ploesti Area Rumania.

11. When, in the spring of 1941, the Nazis attacked Yugoslavia, troops of that country in an effort to block the vital oil traffic on the Danube, dynamited its bridges, wherever possible, and scuttled concrete-filled barges in the Iron Gate gorge, the bottleneck of the river. These acts, however, impeded the Nazis only momentarily. New York Times, 4 May 1941.

12. Lambright Report, AFIOP Target Information Folder.

13. Scholten Report, in ibid.

14. It is true that the oil installations lay within the range of British bombers then based in Greece, and apparently considerable planning had been done; yet the expected attack did not materialize. While this failure of the British to strike puzzled many at the time, there were seemingly good reasons why no such action was taken. In the first place the Greek airfields were inadequate. Moreover, the distance (from 400 to 500 miles, one way), about the extreme radius of many British bombers, was such that definitive results could hardly be expected from operations carried out at that range. Then, too, the airplanes available in Greece were urgently needed for purely military operations. Finally, it appeared unlikely that the attack, if attempted, would produce any significant result.

15. New York Times, 26, 27, 28 June 1941.

16. Paraphrase of code cablegram sgd. Ratay, Mil. Attache, Bucharest, 1 July 1941, Rumania 9930, AFHF Rec. Br.

17. Roumanian Oil Production, Interview with Mr. G. Mattingly of the Standard Oil Co. of N. J., 22 Jan. 1942, Intell. Div., Off. of Chief of Air Staff; Interview of Mr. Paul Lambright, formerly General Manager of Standard Oil Co. of N. J., Interests in Rumania, held at the off. of the Target Info. Unit, Operational Intell. Sec., 27 Apr. 1942; and Lambright Report, AFIOP Target Information Folder. Also, New York Times, 19 July 1941.

18. New York Times, 15 Sep. 1942.

19. Paraphrase of secret msg. recd. at WD 4 Jan. 1942 from Cairo, AFIOP Target Information Folder.

20. Memo, Harry L. Hopkins (The White House) to Gen. Arnold, 26 Jan. 1942, AFAEF Off. Services Br., W.P. III G-6.

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21. Memo for H. L. Hopkins, 31 Jan. 1942, from AAF/A-WPD, dispatched, 2 Feb. 1942, in ibid.

22. Dispatch, AFAMP to WPD, 26 Mar. 1942, in ibid.

23. Memo, Brig. Gen. Thos. T. Handy, GSC, WDGS-Opns. Div., for AFAMP, 10 Apr. 1942, in ibid.

24. Kroner (MILID) to Mil. Attache, Cairo, WD #791, 4 Apr. 1942, CM-OUT-0752.

25. Col. Fellers to MILID, Cairo #987, 22 Apr. 1942, CM-IN-6088; 24 Apr. 1942 CM-IN-6969 and CM-IN-6982.

26. Memo for Director of Mil. Requirements, from Maj. Gen. M. F. Harmon, C/AS, 13 Mar. 1942, and memo for AC/S, WPD from Gen. Harmon, C/AS, 20 Mar. 1942, Air Adjutant General Central Files, 381 War Projects; Gen. Harmon, C/AS, to Dir. of Mil. Requirements Opns. Div., 31 Mar. 1942, AAG 321.9 G 1 Orgn. "Travel Orders for the Halvorson Detachment . . .," memo for the AG sgd. by Col. O. S. Ferson, 17 Apr. 1942, AAG 373 G, Flights-General.

27. Memo for CGAAF from Col. H. A. Craig, GSC, AC/AS, Plans, 15 May 1942, AFAMP, Off. Services Br., W.P. III G-6.

28. In a memo, 11 May, the chairman of the Inter-Divisional Oil Comm. of the Bureau of Economic Warfare had declared that Ploesti was deserving of the highest target priority among all United Nations objectives and that since Germany's production of substitute and synthetic fuels was steadily on the increase, the sooner the attack was made the more damaging it would be to Axis oil economy. He recommended "that the most urgent consideration be given to the immediate carrying out against Ploesti of the plan of attack which has already been elaborated by our military authorities." Because of the proximity of dates one is tempted to assume that this memo might have had a direct bearing on the decision reached only a few days later to employ the Halverson detachment on this mission. "Vulnerability of Germany's Oil Position, Strategic Importance of Ploesti, Rumania," memo sgd. by Ray W. Smith, chairman of Inter-Divisional Oil Comm., BEW, 11 May 1942, in AFIOP Target Information Folder.

29. Memo to the President from AFAMP (Gen. Anderson), 15 May 1942, "Change of Halpro Mission," AFAMP, Off. Services Br., W.P. III C-1.

30. Copy of radiogram, AFIOM to AFMMG, 15 May 1942, AAG 201, Halvorsen, Halvor A. [Harry A. Halverson].

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31. Ltr., AFAEP (Gen. Anderson) to Air Marshal McDill, British Embassy, "Change of Halpro Mission," 15 May 1942, AFAEP, Off. Services Br., W.P. IV C-1.

32. Gen. Marshall to AMSEG Cairo WD 909, 1 June 1942, CM-OUT-0037; Col. H. A. Halverson (Cairo) to AGWAR #1315 AMSEG, 3 June 1942 CM-IN-1017; Gen. Arnold to AMSEG Cairo WD 955, 6 June 1942, CM-OUT-1283.

33. In dealing with their Allies the Russians showed themselves in various ways to be secretive and suspicious. For example, although they desperately needed lend-lease airplanes they were quite unwilling to permit American and British pilots to ferry them over Soviet territory. Nevertheless, on the very day of the departure of the Halverson mission, and after it had actually set out, Soviet authorities finally granted the request of the American government, but under circumstances that created the suspicion that the reply was purposely tendered late to avoid having to grant this favor, and at the same time to escape the charge of non-cooperation in the war effort. Adm. Stanley (Kuibyshev) to MILID #93, 26 May 1942, CM-IN-7513; Gen. Faymonville (Moscow) to AGWAR for Gen. Harmon, #7, 12 June 1942, CM-IN-3669; Gen. Arnold to AMSEG Cairo WD 1012, 12 June 1942, CM-OUT-2765; Moscow to MILID #6, 20 June 1942, CM-IN-7083.

34. Col. Halverson (Cairo) to CGAAF, no #, 13 June 1942, CM-IN-4509; Gen. Maxwell (Cairo) to Gen. Marshall #472, AMSEG, 16 June 1942, CM-IN-5246.

35. Navy Dept. Intell. Rpt. PL 138-42, Roumania 9930, AFIHE Rec. Br.

36. Within a year all of these interned aviators had either been allowed to "escape" or been released by the friendly Turkish government. Mil. Attache, Ankara, to MILID #476, 12 May 1943, CM-IN-8246.

37. Col. Halverson to Chief of AAF, #1481, AMSEG, 17 June 1942, CM-IN-5576.

38. AFMAG to AMSEG (Cairo) WD 1054, 17 June 1942, CM-OUT-3989; AFMAG to AMSEG (Cairo) WD 1053, 17 June 1942, CM-OUT-3990; Gen. Marshall to AMSEG (Cairo) for Gen. Maxwell WD 1079, 18 June 1942, CM-OUT-4477.

39. Project "R", detailed rpt. prepared by Lt. Col. C. V. Whitney, Asst. A-2 of the 9th AF, and submitted to Gen. Brereton in Jan. 1943, 1943 Ploesti Oil Objectives, in AFIHI files.

40. Memo, Col. J. E. Smart to Dr. J. Neither, 10 Jan. 1944, "Operations against Ploesti Oil Refineries," 1 Aug. 1943 [Smart Memo], in ibid.

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[redacted]

41. Interview of 6 July 1942 with Col. Dumas T. Cram, Special Observer asgd. by Gen. Arnold to Halpro Mission, returned from Cairo, 24 June, 1942, AFHQ, Off. Services Br., W.F. III F-4 Egypt.

42. Smart Memo.

[redacted]

1. R&R, DC/AS to AC/AS, Plans, 17 Apr. 1943, "Plan for Attack on Ploesti," AAFEP Eur. Theater Sec. Already, the Combined Chiefs of Staff at their Casablanca meeting in January 1943 had directed the Combined Intelligence Committee to study the Axis oil situation, and, accordingly, within a fortnight two brief reports were submitted. One concerned the oil position of the western Axis powers; the other, that of Japan. In the case of the former, the destruction of the oil refineries and transportation facilities located at Ploesti was indicated as one of the best procedures for seriously damaging German oil economy. The Combined Chiefs of Staff accepted the reports and directed that they be considered in connection with the establishment of bombing priorities in the theaters which they concerned. Notes on JCS 60th Meeting, 2 Feb. 1943; Extr. from Minutes, JCS 60th Meeting, 2 Feb. 1943; Extr. from Minutes, CCS 70th Meeting, 3 Feb. 1943. AFMEP J/CCS Div., 463.7, Germany (12-7-42) [CCS 150].

2. This lengthy memo, which bore the title, "1943 Aid to Russia by by Dislocation and Destruction of Danube River Basin Objectives," suggested Northern Syria as the best base of operations and proposed a preliminary mission against the Rumanian oil industry, employing four heavy bombardment groups, a main element striking at Ploesti while two diversional ones attacked Giurgiu and traffic on the Lower Danube. Subsequent missions against non-oil targets could wait until more suitable bases became available. R&R, AC/AS, Plans, to DC/AS, 27 Apr. 1943, with enclosed memo, for the CGAAF, AFMEP, Eur. Theater Sec.

3. "Plan of Attack on Ploesti," memo for the CGAAF from Brig. Gen. O. A. Anderson, 5 May 1943, binder with supporting material, bearing title, 1943 Ploesti Oil Objectives.

4. Brig. Gen. L. S. Kuter to CGAAF, 5 Oct. 1943, AMG 201 Files, Whitney, C. V.

5. AFMEP to CG USAFIME, 74081, 29 Mar. 1943, CM-OUT-11236; Cairo to AGWAR, WASHMEAF 384, 1 Apr. 1943, CM-IN-559.

6. Smart Memo.

7. It had been worked out in connection with attacks upon ships by Col. S. P. Huff of Ordnance, in collaboration with Col. E. P. Sorenson, then Director of Bombardment, as early as January 1942. Within a short time their work resulted in a directive for tests and development of technique at Eglin Field. Confirmation of the accuracy and general soundness of the technique was seen in the Bismarck Sea operations in March 1943. Impact, May 1943, 9.

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Over the ensuing months there continued to be a great deal of interest, as well as controversy, in the subject. Zero-altitude bombing tactics with heavy four-engined bombers was introduced in the Middle East at the close of March 1943, when 1st Lt. Norman C. Appold conducted a very successful single airplane raid on the chemical works at Crotone, Italy, from an altitude of 50 ft. Unit History of 514th Bombardment Sq. (H), 376th Bombardment Gp., 26 May 1943, in AFHRI files.

8. Digest of Interview with Col. J. E. Smart, AC, 26 Aug. 1943 /Smart Interview/, US 9000 Interviews and Statements, AFHQ, Rec. Br.

9. Smart Memo.

10. Memo directive, Combined Chiefs of Staff to Combined Staff Planners, "Air Attack on the Ploesti Oil Fields from Russia," 14 May 1943, AFHQ Joint and Combined Chiefs of Staff Div. files, 334.3, Ploesti.

11. Note by Secretaries to JCS enclosing rpt. by Advisory Council, AAF, "Air Attack on Ploesti," 17 May 1943, AFHQ J/CCS Div. files, 334.3, Ploesti.

12. It is noteworthy that although this report emanated from a body of which Colonel Smart was a member it is couched in such general terms that it might cover the Whitney plan equally as well as his own. With regard to the level of attack, all that is said is that if larger concentrations of balloons were discovered to exist than the number supposed "the attacks may have to be made from a very high altitude." Aleppo is mentioned along with Tobruk and other points as a possible base of operations.

13. Extr. from Minutes of CCS, 18 May 1943, in AFHQ J/CCS Div. files, 334.3, Ploesti.

14. Extr. from Minutes, Trident, 4th Meeting, 21 May 1943, in AFHQ J/CCS Div. files, 334.3, Ploesti.

15. Algiers to AGMAR [illegible]-1257, 25 May 1943, CM-OUT-16097.

16. Gen. Eisenhower to Gen. Arnold, [illegible]-1835, 3 June 1943, CM-IN-1957.

17. For reasons of security the Ploesti project was originally assigned the code name STATESMAN. After only a few days this was changed to SOAPSUDS, which was retained during the month of June only to be exchanged finally for TIDAL WAVE, in deference to the expressed British view that SOAPSUDS was not an appropriate term for the

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operation. WDGBI to CG Algiers, #282, 26 May 1943, CM-OUT-11055; extr. from Minutes JCS, 22 June 1943, in AFHQ J/CCS Div. files.

18. Gen. Eisenhower to CCS, #N-2064, 5 June 1943, CM-IN-3107.

19. This CCS meeting was preceded by a JCS meeting on the same day, in which it was agreed that the two B-24 groups to be diverted from the UK for SOAPSUDS should not be absent for more than 15 days, in order that the bomber offensive against continental objectives should not suffer serious setback; and that the 389th Group, which was to be sent from the United States for SOAPSUDS operation, should be used in other operations only to the extent necessary to prepare it for the major undertaking. General Marshall reported to the JCS on the discussions held in North Africa, in which he had, along with the British Prime Minister and others, participated. General Eisenhower, in the first place, had held that the SOAPSUDS operation, if successful, would definitely aid the Russians; on the other hand, there were serious considerations with regard to HUSKY at this time which he did not wish to prejudice. Churchill expressed the view that there were other German-controlled refineries which could make good the shortage due to damage inflicted upon the Ploesti refineries and pointed out that even if SOAPSUDS were successful the Soviets would experience no appreciable benefit before about three months. British experts, however, when consulted, said that the effects would be felt within a month. Air Chief Marshal Tedder, wanting additional groups for HUSKY, appeared enthusiastic about SOAPSUDS, provided the B-24 groups could be moved to North Africa in time to take part in the invasion of Sicily. Notes on JCS Meeting of 8 June 1943; Extr. from Minutes, Supplementary Minutes, JCS, 8 June 1943, in AFHQ J/CCS Div. files, 334.3, Ploesti.

20. CCS to Gen. Eisenhower, #334, 8 June 1943, CM-OUT-3272. Gen. Ira C. Eaker took a serious view of the effects of this decision upon the program that his air force was then engaged in carrying out. He addressed himself to General Arnold, as follows: "I am greatly disturbed about the diversions which have come up to the Combined Bomber Offensive. The Combined Chiefs of Staff have approved it, but there is evidence that the force will be dispersed and we will be prevented from accomplishing it by these continual diversions. The latest concerns the sterilization of our two B-24 Groups for the summer in connection with "SOAPSUDS" and the information we received yesterday that one of our Heavy Groups due in July is to be retained in Africa. . . . I believe it is only fair for me to state now that if these diversions are to continue it will be impossible to accomplish the result anticipated, simply because the force required will not be furnished." Gen. Eaker to Gen. Arnold, 8 June 1943, in AFHQ Exec. files, 373.11, Bombing.

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21. Gen. Eisenhower to Gen. Marshall, Eyes Only #159, 20 July 1943, C.M-IN-14163, in which Gen. Arnold was informed as follows: "We deplore abandonment of plans after an objective has been decided upon and preparations therefor definitely undertaken. . . . We understand General Baker's anxiety to get the maximum bomber force concentrated in England. However, we want to point out that both the operations contemplated /Ploesti and Wiener-Neustadt, Austrian center of fighter factories/ have a direct effect upon the whole European situation, and that, beneficial results of successful raids will be felt in the UK /United Kingdom/ possibly even more markedly than here. In other words, both these operations are in support of the raids now being carried out from the UK and it merely happens that we have the more practicable bases from which to execute them. In view of this, we feel that the insistence upon the early return to the UK of the 3 B-24 Groups is not consistent with the conclusions as to the importance of the 2 operations. Both Tedder and Spaatz are of the conviction that we must carry out more than 1 attack in the Tidalwave /that is, Soapsuds/ operation. They feel that if we should fail to follow up, we will probably lose much of the value of the first attack. Their conclusion is that the attacks should be continued, assuming reasonable success in the first one, until our experts state that from 60 to 70% destruction has been accomplished in the target area. Tedder and Spaatz additionally point out that their views are based upon a consideration of factors applying to the European war as a whole, since neither target is a specific or particular objective for this theater. The B-24 groups should be returned to England immediately these two operations are completed."

22. Memo, Chief of Staff, US Army, to JCS, 14 June 1943, AFAHP J/CCS Div. files, 580.8, Russia.

23. Notes on JCS Meeting, 15 June 1943; Extr. from Minutes, Supplementary Minutes, JCS Meeting, 15 June, AFAHP J/CCS Div. files, 580.8, Russia.

24. Memo from C/S, US Army, to CCS, 15 June 1943; Notes on CCS Meeting of 18 June 1943, AFAHP J/CCS Div. files, 580.8, Russia.

25. Outline History of Operations against Rumanian Oil Refineries, prepared in Advanced Headquarters of Ninth U.S. Air Force, 14 July 1943 /Outline History of Operations/ in collection of documents, Ploesti Mission, Ninth U.S. Air Force, August 1, 1943 /Ploesti Mission/, in AFHHI files.

26. Smart Memo.

27. Smart Interview.

28. Outline History of Operations, Ploesti Mission.

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29. Smart Interview.

30. Outline History of Operations, Ploesti Mission.

31. Notes on Meeting of the Planning Committee, Soapsuds Operation, Ploesti Mission.

32. Questions Asked Colonel Smart in Personal Interview, 2 Mar. 1944 [Questions Asked Colonel Smart], in AFIHI files; Col. Smart to Gen. Arnold, Cairo AMSMAF 1413, 25 June 1943, CM-IN-15896.

33. Gen. Brereton to Gen. Arnold, 22 July 1943, AAG 312.1 D, Opns. Ltrs.

34. AAFSAT Air Room Interview of Col. J. E. Smart "Target! Ploesti Oil Fields," AAFSAT Intelligence Reports, No. 22, Jan. 1944 [Smart AAFSAT Interview].

35. The Operations Analysis Section consisted of eight civilian specialists familiarly known as "the QuizKids," headed by Samuel G. Frantz. Their primary function was to provide the command with technical studies of practical problems that arose from time to time. Their work was of inestimable value. Naturally, their services were enlisted in connection with various problems which arose in the detailed planning of the Ploesti Mission.

36. Ltr., Gen. Ent to Gen. Brereton, 30 June 1943, "High vs. Low Level Attacks"; memo by S. G. Frantz, dtd. 30 June 1943, "Bombing from Lower Altitudes," Ploesti Mission.

37. Comparison of Two Plans ("Annex C" to Second Plan for Attacking Minimum Number of Targets), Ploesti Mission. For a detailed statement of the advantages and disadvantages of the two plans see Appendix 1.

38. Second Plan for Attacking Minimum Number of Targets, Ploesti Mission.

39. Proposed Messages to American and British Chiefs of Staff, and Outline History of Operations, Ploesti Mission.

40. Questions asked Colonel Smart.

41. Second Plan for Attacking Minimum Number of Targets, Ploesti Mission.

42. SO 71, Advanced Hq., 9th USAF, 1 July 1943, Ploesti Mission.

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43. Assignment of Duties for Officers Charged with Preparations Necessary for Tidal Wave, in ibid.

44. Colonel Timberlake, an able officer of considerable experience in the European and North African theaters, believed firmly in the soundness of the TIDAL WAVE project and aggressively aided Colonel Smart in forwarding it.

45. Col. Smart to Gen. Arnold, Cairo MESMAF 1413, 25 June 1943, CM-IN-15896.

46. About this time Maj. Gen. R. Royce wrote to General Arnold from Cairo, as follows: "Security around this headquarters is practically non-existent. All the typists and file clerks are hired locally and I suspect everyone of them. The City is full of people gathering and selling information and I feel that even those who are pro United Nations are giving all information of everything that happens in this office to British sources." Undated memorandum received 21 Oct. 1943, AAG 312.1 FD, Cpns. Ltrs.

47. Maj. G. H. Morgan, History of Ninth Bomber Command in the Middle East /History of Ninth Bomber Command/, Chap. V, 1, in AFHRI files.

48. In order further to insure security, the planning staff produced a cover plan. It proposed that a rumor be spread among the crew members to the effect that the low-level attack was being prepared against targets in Rome in order to insure absolute accuracy, thus avoiding damage to Vatican properties. A second rumor was to be circulated naming certain dams and other hydro-electric installations of Italy as the object of the forthcoming low-level attack. Intelligence Cover Plan, Ploesti Mission. See Chap. IV, p. 93, n. 55.

49. See Table I, Targets and Target Forces Plans.

50. Allocation of Target Forces to Objectives, 9 July 1943, Ploesti Mission.

51. Recommendation of Planning Committee for the Commanders and Flight Leaders of the Target Forces, 9 July 1943, in ibid.

52. This is outlined in SO #53. Additional details are found scattered through various training documents and a diagram of the practice field laid out according to scale and relative locations, all of this material being found in the collection, Ploesti Mission.

53. Weekly Status and Operations Report (Form 1-24), 1-7 Aug. 1943, AFHRC.

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54. Memo, Col. A. R. Cyr, ordnance officer, 9th AF to Gen. Brereton, 4 July 1943, "Selection of Bombs," Ploesti Mission.

55. Memo, Capt. L. Baer, ordnance officer, IX Bomber Command, to Gen. Ent, 13 July 1943, "Use of Fuse, Tail M-124, for Low Level Bombing with the 1000-lb. Demolition Bomb," in ibid.

56. AFRDB to Gen. Brereton #5423, 22 June 1943, CM-OUT-9296; Gen. Brereton to Gen. Marshall, Cairo #AMSMAF 1379, 23 June 1943, CM-IN-14569; AFRDB to Gen. Brereton, #5486, 26 June 1943, CM-OUT-11106.

57. See Table II, Bomb Load Plan.

58. Gen. Baker to Gen. Arnold, London #M-361, 2 June 1943, CM-IN-920; AFRDB to Gen. Eisenhower, #217, 13 June 1943, CM-IN-5456; Gen. Devers to Gen. Marshall, USFOR London #M-757, 15 June 1943, CM-IN-9220.

59. Results of Fuel Consumption Test, 21 July 1943, Ploesti Mission.

60. Second Interrogation Report on Nikolai Feodor, Roumanian Pilot, 28 July 1943, AFIOP Target Information Folder.

61. Paper bearing title "Target Objective: Ploesti (Rumania) Problem: Defenses," Ploesti Target Folder, in AFIHI files.

62. Field Order #58, Intelligence Annex 2, 28 July 1943, Ploesti Mission.

63. Rpt. on Flying through Balloon Barrages, 29 June 1943, sgd. by S. G. Frantz, Chief of OAS, IX Bomber Command; also Memo, "Conference at Camp Tyson, Tennessee," 24 May 1943, in AFIHI files.

64. "The Effect of Surprise on the Tidalwave Defenses," Ploesti Mission.

65. "Target Objective: Ploesti (Rumania) Problem: Defenses," Ploesti Target Folder; also, Field Order #58, Intelligence Annex 2, 28 July 1943.

66. Memo on Crude Oil Smoke Screens, 30 June 1943, addr. to CG, IX Bomber Command, sgd. S. G. Frantz, Chief of OAS, in ibid.

67. Field Order #58, Intelligence Annex 2, 28 July 1943, in ibid.

68. Smart AAFSAT Interview.

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69. "The Effect of Surprise on the Tidalwave Defenses," Ploesti Mission.

70. Brief Notes on Weather Conditions of Hungary and Rumania, Weather Central, IX Bomber Command, in ibid.

71. Weather Forecast July 15 to August 10, 1943, Col. R. T. Lester, in ibid.

72. This point, imparted by Colonel Smart in confidence, cannot be published.

73. Timing of Attack, 20 July 1943, in ibid.

74. Estimate of Number of Sorties and Time to Complete Task Assuming 50% Destruction on Initial Low Level Attack, in ibid.

Chapter III

1. Gen. Marshall to Gen. Devers for Gen. Baker, #R-9460, 11 June 1943, CM-OUT-4539; Gen. Eisenhower to Gen. Devers and Gen. Marshall, Algiers #N-2995, 18 June 1943, CM-OUT-11479.

2. Gen. Devers to Gen. Marshall, USFOR London #N-757, 15 June 1943, CM-IN-9220. Generals Devers and Baker apparently continued to feel misgivings at the temporary loss of three of their bomber groups, General Devers cabling General Marshall, as follows: "Loss of 3 groups from this theater at this most critical time reduces our strength by 1/5. These units should be returned at earliest possible date to insure our ability to meet target program laid down by Combined Chiefs of Staff. Recommend that these groups be definitely reserved for Soapsuds only and returned as soon as it is completed." General Marshall agreed with General Devers. Gen. G. C. Marshall to Gen. D. C. Eisenhower, #439, 16 June 1943, CM-OUT-6777.

3. Gen. Baker to Gen. Marshall, USFOR London #N-1132, 26 June 1943, CM-IN-16339; same to same, USMAW London #N-1172, 27 June 1943, CM-IN-17138; same to same, USFOR London #N-1375, 2 July 1943, CM-IN-987.

4. Gen. Brereton to CG USMAF, Report of Operations against Rumanian Oil Refineries, 8 Aug. 1943 ["Brereton's Report of Operations"], Ploesti Mission.

5. Morgan, History of Ninth Bomber Command, Chap. IV.

6. The 389th Group, before leaving the United States, had combined low-level tactics with the final stage of their training. Morgan, History of Ninth Bomber Command, Chap. V, 1.

7. Col. J. E. Smart, "Planning the Mission," Air Force, vol. 26 (Nov. 1943), 9.

8. Memo, sgd. by Maj. J. L. Jerstad to Col. J. E. Smart, 17 June 1943, "Preparation of Groups for 'Soap Suds'," and Memo sgd. by Lt. Col. A. E. Baker to CO, 201st Provisional Combat Wing, 19 June 1943, "Training for Low Level Attack," Ploesti Mission.

9. Morgan, History of Ninth Bomber Command. Chap. V, 1.

10. Assignment of Duties for the Officers Charged with the Preparations Necessary for Tidal Wave, Ploesti Mission.

11. Training Plan for Soapsuds, in ibid.

12. Suggested Training Program for Minimum Altitude Bombing, in ibid.

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13. Morgan, History of Ninth Bomber Command, Chap. V, 3.

14. Gen. Eisenhower to Gen. Marshall, Eyes Only, Adv. Afr. Hq. #162, 20 July 1943, CM-IN-14181.

15. After announcing that the objective was the Rumanian oil refineries and indicating their importance to the European Axis, he declared that the denial of Rumanian oil would end the German hope for a successful offensive against Russia as well as for a successful defense against the Allied invasion of Italy. The complete destruction of the Ploesti refineries, followed by attacks against other related objectives, might shorten the European war from six months to a year. He continued, "The piecemeal destruction of the Roumanian Refineries will not have the desired effect. Destruction must be complete and final. Our forces, led by you men, must sweep clean the Roumanian Oil Industry as would a gigantic Tidal Wave. . . . No more important task has ever been assigned one striking force. 200 heavy bombers and 2,000 men, . . . have been assigned a task that could not be accomplished by a dozen ground divisions in a period of months. You men must do the job virtually in one day. Obviously this operation is not an easy one. It is most difficult. Its success depends upon many factors; the most important of which is leadership. . . . That can be supplied only by you men here. . . . You must do everything possible to make the operation successful. . . . The nature of this operation is such that the detailed movement of each striking force must be executed with precision and exact timing. I should like to point out that this is a 100% American Air Force Operation. In the belief that the RAF was better capable of combating the static defenses around the target, the Prime Minister and Sir Charles Portal, the Chief of the British Air Staff, both offered RAF Lancasters to comprise the first wave through the defenses. This sincere offer was refused in the firm conviction that the American Air Forces needed no spearheads in their encounters with any enemy on the face of the earth or in the sky above it." Proposed Address by Major General Brereton — Introduction of Tidal-Wave to Group Commanders, Flight Leaders and Deputy Flight Leaders—Adv. Hq. 9th AF, 19 July 1943, Ploesti Mission.

16. For the results of the fuel consumption test see Chap. II, 49.

17. The material contained in this description of training operations, unless otherwise indicated, was drawn from the following documents contained in the collection Ploesti Mission; Coordination of Range Times, sgd. by Maj. J. L. Jerstad, 21 July 1943, addressed to all Group Commanders; Outline for Preliminary Training, sgd. by Maj. J. L. Jerstad, 23 July 1943, addressed to all Group Commanders; Proposed Practice Operations for Monday, 26 July, sgd. by Maj. J. L. Jerstad, 25 July 1943, addressed to

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CG IX Bomber Command; Tentative Training Schedule for 26, 27 and 28 July, sgd. by Maj. J. L. Jerstad, 25 July 1943, addressed to CG IX Bomber Command; proposed Practice Operation for Tuesday, 27 July, sgd. by Maj. J. L. Jerstad, 22 July 1943, to CG IX Bomber Command.

18. Ltr., Gen. Brereton to Gen. Arnold, 22 July 1943, AAG 312.1 D, Opns. Ltrs.

19. Capt. John S. Young, "Over the Target," Air Force, vol. 26 (Nov. 1943), 11.

20. "Ploesti: Operational Training and Plans for the Mission," AFGIB, Sep. 1943, 30-31.

21. Memo for Planning Staff, "Briefing and Training," Ploesti Mission.

22. Suggested Training Program for Minimum Altitude Bombing, in ibid.

23. Briefing Schedule for Tidal Wave Operation, in ibid.

24. SO 41, 1 July 1943, sgd. by Gen. U. C. Ent, C/S, Adv. Hq., 9th AF, in ibid.

25. Target and Briefing Material for Tidal Wave, in AFHRC Rec. Br.

26. Rpt. on Intelligence Lessons Learned on Ploesti Raid, 1 Aug. 1943, sgd. by G. K. Geerlings, Maj., AC, dtd. 12 Aug. 1942 [Geerlings Report], 9th AF Evaluations (1943).

27. Ibid.

28. Smart Interview.

29. Geerlings Report, 9th AF Evaluations (1943).

30. The briefing film of the Ploesti mission was twice viewed by the author at the Motion Picture Services Off., AC/AS, OC&R, in the Pentagon.

31. Each crew member was provided with an escape purse containing six American dollars, 3,000 Grecian drachmae and 1,500 Italian lire, as well as a small silk map.

32. Capt. William D. Banks, "The Moment of Attack; Two First-Hand Reports. II Target: Ploesti," [Banks, "The Moment of Attack"], Harper's Magazine, vol. 188, no. 1126 (March 1944), 299-304.

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33. Geerlings Report, 9th AF Evaluations (1943).

34. Morgan, History of Ninth Bomber Command, Chap. V, 1.

35. Smart Interview.

36. Morgan, History of Ninth Bomber Command, Chap. V, 3.

37. Smart Interview.

38. Maj. Gen. Delmar H. Dunton, deputy commander of the AAF Air Service Command, has spoken of the Ploesti mission as a "hot project if we've ever handled one." Evening Star (Washington, D. C.), 29 Apr. 1944.

39. History of the Repair Squadron, 26th Air Depot Group, 1 Sep.-31 Dec. 1943, in AFIHI files.

40. Brereton's Report of Operations, Ploesti Mission.

41. Cairo to ACMAR-ASCPFO, WAMSMEAF 1510, 4 July 1943, CM-IN-2762.

42. Some 300 new engines were shipped to the Middle East on one of the fastest American ships, a former luxury liner, for installation in the B-24's. Gen. Dunton is quoted as stating that ". . . the round trip on the raid route required the performance of completely new engines in each of the bombers." Evening Star (Washington, D. C.), 29 Apr. 1944.

43. Cairo to ACMAR-ASCPFO WAMSMEAF 1692, 17 July 1943, CM-IN-12071. Also, Gen. Brereton to Gen. Arnold, 22 July 1943, AAG 312.1 D, Opns. Ltrs.

44. Young, "Over the Target," Air Force, vol. 26 (Nov. 1943), 11.

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Chapter IV

1. The private correspondence and interviews of the Ploesti men after the attack abounded in such statements as these: "The Ploesti mission was the biggest thing I was ever on," "I just returned from one of the greatest raids ever pulled," "On August 1st we made history in one of the most daring raids yet made in this war," and "It was the most exciting raid I've seen so far and I'm confident I won't have anymore as exciting experience." Off. of Theater Censor, Participant Flyers' Reactions to Ploesti Raid, 20 Aug. 1943, Roumania 9910-9960, AFHQ Rec. Br.

2. A vivid description of the mission written from the standpoint of one who stayed behind at the base is found in Morgan's History of the Ninth Bomber Command, Chap. V.

3. Brereton's Report of Operations, Ploesti Mission.

4. F/Lt. George C. Barwell, RAF air gunnery expert assigned to the Ninth AF, flew as top-turret gunner in the crew of Maj. Norman C. Appold, 376th Group.

5. A glance at the crew lists reveals such names as these: Bagby, Jones, McDonald, Flaherty, Reinhart, Van Kleeck, Lejeune, Rodriguez, Pezzolla, Paulsen, Sundstrom, Leibowitz, Tiercisewski, Tabacoff, Raspotnik, Janocek, Stampolis, Kasparian, Kuroki.

6. Colonel Smart planned to go on the mission but the day before D-day he was ordered to remain behind. The ship in which he was to have flown was one of the few that got back without a scratch. Questions asked Colonel Smart.

7. Smart Memo.

8. Ploesti Mission Sortie Reports, 376th Group, in AFHQ files.

9. Smart Memo. As will be shown later, this unfortunate accident which resulted in the change of leaders had nothing to do with two of the groups approaching the target from the wrong direction.

10. Interview with Col. John R. Kane, 14 Dec. 1943 [Kane Interview], Interviews, AFHQ Rec. Br.

11. Ibid. According to Colonel Smart (Smart Interview), the 98th Group flew at a slower speed. Colonel Kane states positively that the speed was not reduced.

12. Brereton's Report of Operations, Ploesti Mission.

13. This mistaken identity appears to have been unavoidable since no identification had been arranged, it not being considered necessary.

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14. The AFIMF printed report on the Ploesti attack states that the rear element flew as far west as Gruia, Rumania, and that there the 389th Group left the formation, proceeding to Pitesti alone. The basis for this statement is unknown. Operations of Heavy Bombardment Units against Rumanian Oil Refineries in Ploesti Area, 1 Aug. 1943, 28.

15. Description of Route-Pitesti, Targoviste, Floresti, Ploesti Mission.

16. Banks, "The Moment of Attack," Harper's Magazine, vol. 188, no. 1126 (Mar. 1944), 299-304.

17. Young, "Over the Target," Air Force, vol. 26 (Nov. 1943).

18. Banks, "The Moment of Attack," Harper's Magazine, vol. 188, no. 1126 (Mar. 1944), 299-304.

19. Smart Interview; also, Smart Memo.

20. Smart Interview.

21. Concerning this matter, Capt. R. L. Lebrecht of the 98th Group expressed himself as follows: "It is unfortunate that the target had been hit before we got there, and I think that is mainly responsible for the losses of the 98th Bomb Group." Interview with Capt. R. L. Lebrecht, 17 Sep. 1943 [Lebrecht Interview], United States 9000, Interviews and Statements, AFIMF Rec. Br.

22. Ploesti Mission Sortie Reports, 93d and 376th Groups, AFIHI files.

23. It appears that by the time the attack was delivered by the 98th and 44th Groups, 10 or 15 minutes later, weather conditions had improved.

24. Operations Summary, Ploesti Mission.

25. The 376th flew northeast of its target without identifying it. Gen. Brereton to Gen. Marshall, Cairo AMSHEAF 1835, 2 Aug. 1943, CM-IN-1364.

26. Smart Interview.

27. Ploesti Mission Sortie Reports, 376th Group.

28. Smart Interview. The sortie reports for Major Appold's plane says that he "led three-plane formation over unidentified target, believed to have been White 2." Colonel Smart insists that it was a six-plane formation.

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29. Ploesti Mission Sortie Reports, 376th Group, Ship 20E.

30. Operations Summary, Ploesti Mission.

31. New York Times, 3 Aug. 1943.

32. Evening Star (Washington, D. C.), 2 Aug. 1943.

33. Anon. [Maj. Frank O. Hailey], Desert Campaign, 114.

34. Evening Star (Washington, D. C.), 2 Aug. 1943.

35. New York Times, 3 Aug. 1943.

36. Smart Interview.

37. Operations Summary, Ploesti Mission.

38. Off. of Theater Censor, Participant Flyers' Reactions to Ploesti Raid, Roumania 9910-9960, AFIMF Rec. Br. Another wrote: "We were so long over enemy territory that we felt like taking out citizenship papers in some of those countries."

39. Two, possibly three, aircraft are believed to have been lost as a result of the explosion of delayed action bombs.

40. GO No. 54, WD, 7 Sep. 1943. See Citations in Appendix 3.

41. Ploesti Mission Sortie Reports.

42. Evening Star (Washington, D. C.), 2 Aug. 1943.

43. Ploesti Mission Sortie Reports, 44th Group.

44. One plane is reported to have flown so low that its bomb bay doors were ripped off by a cornfield fence. New York Times, 3 Aug. 1943.

45. Young, "Over the Target," Air Force, vol. 26 (Nov. 1943), 11-13.

46. Kane Interview.

47. These claims are, perhaps, somewhat excessive.

48. GO No. 20, WD, 11 Mar. 1944; GO No. 72, WD, 23 Oct. 1943; GO No. 17, WD, 26 Feb. 1944. See citations in Appendix 3.

49. Ploesti Mission Sortie Reports, all groups.

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50. New York Times, 3 Aug. 1943.

51. Off. of Theater Censor, Participant Flyers' Reactions to Ploesti Raid, Roumania 9910-9960.

52. Brereton's Report of Operations, Ploesti Mission. This report reads, "by continually bearing to the northwest," which seems impossible since the general course was southwest.

53. The route that was flown required a round trip ground distance of approximately 2,100 miles to be flown. The air mileage was greater.

54. Morgan, History of Ninth Bomber Command, Chap. V, 4.

55. Investigation, subsequent to the mission, revealed that gossip, discussion, and conjecture were general both at Bengasi and Cairo concerning the preparations. In some instances the rumors that circulated were exceedingly accurate. No direct evidence was discovered, however, indicating that civilians in Bengasi or Cairo were familiar in advance with the details of the mission. Based on items found in IX Bomber Command Security and Subversive Intelligence Correspondence, Ninth Air Force, AFIHI files.

56. The data concerning losses given here are based on the Ploesti Mission Sortie Reports and cable messages and reports received from American agents in neutral European countries. This material is found in AFIHI files and AFINF Rec. Br.

57. Six aircraft were able to return to Allied bases despite having hit balloon cables.

58. Lebrecht Interview.

59. New York Times, 5 Aug. 1943.

60. Ltr., Gen. Arnold to Gen. Brereton, 11 Aug. 1943, in AAG 312.1 D, Cpns. Ltrs.

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Chapter V

1. Middle East Interpretation Unit, Photographic Interpretation Reports [ME Interpretation Unit] Nos. 3294 (5 Aug. 1943) and 3369 (20 Aug. 1943), Ploesti Mission.

2. Morgan, History of Ninth Bomber Command, Chap. V, 7.

3. Brereton to Marshall, Cairo [illegible] 1835, 2 Aug. 1943, CM-IN-1364.

4. Report on Roumanian Oil Targets, sgd. by Lt. Col. V. L. Forster, dtd. 13 Aug. 1943, Rumania 9930, [illegible] Rec. Br.

5. Report on Roumanian Oil Targets II, sgd. by Mr. L. Eisinger, dtd. 22 Aug. 1943, Rumania 9930.

6. Paraphrase of telg. to Sec. of State, Ankara, [illegible] 1335, 3 Aug. 1943, CM-IN-7346.

7. The Nazis, while playing down the effect of the attack in their press, are reported to have told the Rumanians to exaggerate the damage in order to forestall further raids. Report from Mil. Attache, Istanbul, 2 Oct. 1943, Rumania 9930.

8. Damage Report to AMAF on Ploesti Oil Refineries, submitted by John H. Wisdom, Maj. AC, Exec., Target Info. Br., AFHQ.

9. Ibid.

10. Gen. Eisenhower to Gen. Marshall, Eyes Only [illegible]159, 20 July 1943, CM-IN-14163.

11. CG, Algiers to War, [illegible]-7193 MAF 319, 12 Aug. 1943, inclosed in memo by the Secretaries, to CCS, 12 Aug. 1943, in AFHQ J/CCS Div. files, 334.3, Ploesti.

12. Memo for Gen. Ruter, sgd. Col. J. S. Loutzenhiser, in AFHQ J/CCS Div. files, 334.3, Ploesti.

13. Memo for Gen. E. P. Sorensen, sgd. Maj. J. M. Wisdom, 11 Sep. 1943, AMG 319.1 M, Reports.

14. Memo for CCS by JCS, Operations by Red Air Force Subsequent to "Ridalkwave," 3 Sep. 1943, in AFHQ J/CCS files, 580.8, Russia.

15. Notes on CCS 118th Meeting, 10 Sep. 1943, in AFHQ J/CCS Div. files, 580.8, Russia.

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17. MID Mil. Attache Report, Istanbul #72, 14 Aug. 1943, Rumania 9930, Nov. 1941-Aug. 1943.

18. Mil. Attache Report, Istanbul #3068, 8 Oct. 1943, Rumania 9815, AFINF Rec. Br.

19. Orders were found in some of the crashed planes enjoining crews to be particularly careful to avoid harming the civilian population.

20. Harrison to Sec. of State from Mil. Attache for MD, Berne #4701, 3 Aug. 1943, CM-IN-2743.

21. Ploesti Mission, 1 Aug. 1943, MEIU (RAF) MD, 9th AF Combat Rpt. (Enclosure File), in AFINF Rec. Br.

22. Fifteen aircraft of the 44th Group and 20 of the 98th reported attacks by enemy fighters. Only 11 ships of the remaining three groups reported attacks.

23. A report received through a local agent, considered reliable, placed Axis losses at 4 German and 8 Rumanian fighters destroyed and 20 damaged, Alusna, Ankara to CNO #151230, SCR No. 7, 15 Aug. 1943, CM-IN-11891.

24. The data contained in this section are based primarily on a Press Release of the War Department's Bureau of Public Relations dated 17 Nov. 1943 and supplements. Additional data are drawn from General Orders.

25. See Appendix 3 for text of citations.

26. Memo from AC/S, A-2, IX Bomber Command to CG, Report on Ploesti Raid Results, 26 Aug. 1943, Spot Reports, IX Bomber Command, in AFIHI files. Also, New York Times, 12 Aug. 1943.

27. Conditions and Treatment in Enemy Hospital PCW Camp in Rumania, Off. of Censorship, United States 9950, in AFINF Rec. Br.

28. New York Times, 19 Aug. 1943.

29. Ankara to Dept. of State, #1771, 25 Aug. 1943, CM-IN-19523.

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31. Ankara to Sec. of State, #1417, 13 Aug. 1943, CM-IN-11558.

32. Gen. Eisenhower to Gen. Marshall, Eyes Only #159, 20 July 1943, CM-IN-14163.

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GLOSSARY OF SYMBOLS AND ABBREVIATIONS

AAG	Air Adjutant General
AC/AS	Assistant Chief of Air Staff
AC/S	Assistant Chief of Staff
AFABI	AC/AS, Intelligence
AFAEP	AC/AS, Plans
AFIHI	AC/AS, Intelligence - Historical Division
AFINF	AC/AS, Intelligence - Informational Division
AFIOP	AC/AS, Intelligence - Operational Division
AFAAG	Air Adjutant General
AFSSC	Statistical Control
Afr.	Africa, African
AFROM	Movements and Operations Division
AFROB	Directorate of Bombardment
AGWAR	Adjutant General, War Department
AMSHG	Cable Designation for Asmara Headquarters Traffic
AMSNEAF	Cable Designation for Ninth Air Force and Ninth Service Command Traffic
ASCPFO	Air Service Command, Patterson Field, Ohio
BEW	Bureau of Economic Warfare
C/AS	Chief of Air Staff
CCS	Combined Chiefs of Staff
CGAAF	Commanding General, Army Air Forces
Chap.	Chapter
CM	Cable Message
CNO	Chief of Naval Operations
Ctd.	Cited
DC/AS	Deputy Chief of Air Staff
Dem.	Demolition
Doc., Docs.	Document, Documents
Dtd.	Dated
Est.	Estimated
Eur.	Europe, European
Exec.	Executive
Extr.	Extract
F/Lt.	Flight Lieutenant
G/C	Group Commander
Intell.	Intelligence
IP	Initial Point
JCS	Joint Chiefs of Staff
J/CCS	Joint and Combined Chiefs of Staff
JICAME	Joint Intelligence Collection Agency Middle East
ME	Middle East
MEIU	Middle East Interpretation Unit
MID, MILID	Military Intelligence Division, G-2
OAS	Operations Analysis Section, IX Bomber Command
OC&R	Operations, Commitments and Requirements
Off.	Office
OPD	Operational Plans Division
OSS	Office of Strategic Services

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PAW	Petroleum Administration for War
P/W, POW	Prisoner of War
RDF	Radio Direction Finder
Sec.	Secretary
Sgd.	Signed
Subcomm.	Subcommittee
Summ.	Summary
UK	United Kingdom
USAFIME	United States Army Forces in the Middle East
WDGBI	War Department Intelligence, G-2
WPD	War Plans Division

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These files contained principally official correspondence pertaining to the mission and its background. Decimal classifications investigated were:

201	
312.1 D, E	Classified Operations Letters
319.1 K	Reports
321.9 G 1	Organization
373 G	Flights - General
381	War Projects

AAG 201 Files.
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AC/AS, Intelligence, Historical Division Files (cited AFIHI files).
This collection, consisting principally of materials forwarded to Hq., AAF by historical officers serving with the several air forces, proved of the greatest value in the preparation of this study. Especially important were the following items:

Ploesti Mission, U.S. Air Force, August 1, 1943. Collection of mimeographed and typewritten material accompanied by photographs and drawings, organized as follows: Discussions and Decisions Leading to Adoption of Low-Level Bombing; Training for Tidal-Wave; Maps of "Dummy Target" Construction; Recommendations to Major General Brereton Regarding the Execution of Tidal Wave; Reports on Operations; Photographic Interpretation Reports. The following specific items are to be noted: 4-page mimeographed History of Operations against Rumanian Oil Refineries, dated 14 July 1943, but continued beyond that date; Relative Advantages and Disadvantages of Low-Level Attacks; Training Plan for Soapsuds; Briefing Schedule for Tidal Wave Operation; Field Order No. 53 [somewhat revised by subsequent one issued same day, 23 July]; Operations Summary; Report of Operations against Roumanian Oil Refineries to CG USAAF, dated 8 August and signed by Maj. Gen. Lewis H. Brereton; Photographic Interpretation Reports.

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Annex A

In contemplating the destruction of the Ploesti refineries the relative advantages of low or high level attacks must be considered. They are listed below. The problem is to destroy a number of small, dispersed, and well-protected targets with a force of 200 aircraft or less.

Low Level Attack

1. Advantages.

a. a. Bombing.

(1) From low level relatively small individual targets can be picked out from their surroundings and aimed at.

(2) Attacks can thus be confined to key installations.

(3) Accuracy, after the individual targets are picked out, is greater than from high altitude, and a greater percentage of the bombs dropped will be effective.

(4) A smaller force would be necessary to hit individual objectives from low altitude than from high.

(5) Medium cloud over the target would not effect the mission.

(6) Although it would be over optimistic to assume that all the objectives aimed at could be destroyed in one raid, it is quite possible with the force at our disposal, that one low altitude attack would be sufficient to destroy enough of those objectives to dislocate the target as a whole.

b. Enemy Action.

(1) There is no danger from heavy flak.

(2) There will be little danger from fighters in the target vicinity.

(3) A higher degree of surprise may be expected.

(4) That surprise might well neutralize a large proportion of the enemy ground and air defenses, i.e., light flak, fighters, balloons and smoke pots.

(5) The sight of a large number of heavy bombers attacking at low level should have an effect on the morale of the gun crews.

c. Abstract Advantages.

(1) If successful, the destruction or dislocation of one-third of Germany's refining capacity by one attack would have a tremendous morale effect.

2. Disadvantages.

a. Bombing.

(1) The method of attack is new to all crew members and necessitates considerable training.

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(2) The aircraft was not designed for low level bombing and will not be easily man manuevered in case error is made in the run up.
(3) The air crews will not be easily sold on low level and will therefore not be as determined as from high level. More turnbacks may be expected.
(4) Fear of enemy ground defense installations may well cause a decrease in bombing accuracy.

b. Enemy Action.
(1) The aircraft to be used is slow and little or no effective evasive action can be taken on this type of attack.
(2) There will be danger from light flak and balloons.
(3) The formation will necessarily be such that the destruction or deflection of one of our aircraft may well lead to its running into one or more accompanying aircraft.
(4) Unless surprise is attained an efficient smoke screen at low level would have a very good chance of completely hiding the targets.
(5) Bad luck or lack of surprise might easily result in very heavy losses of aircraft and trained crews with a chance of doing little damage to the target.

c. Other disadvantages.
(1) A certain time must be allotted to the all important task of training the individual air crews for the parts which they will play.
(2) A disastrous or unsuccessful mission would adversely affect the morale of participating units and allied and occupied nations.

High Altitude Attack

1. Advantages.
a. Bombing.
(1) Crews are trained for and practiced in high altitude bombing. No special training will be necessary.
(2) Their confidence would better assure their getting to a proper position over the target.
(3) Whether the specific targets are hit or not, it can reasonably be expected that an enormous amount of damages will be done to other installations with resulting dislocations.

b. Enemy Action.
(1) There will be no danger from light flak or balloons.

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(2) Dispersion in formation will make it reasonably certain that the destruction of one aircraft need not affect other aircraft.
(3) Evasive action vertically and laterally is practicable against flak.
(4) It is felt that a smoke screen, no matter how efficient, will not entirely deny the target to our force.
(5) Losses by a fore-warned enemy in one attack would be considerably lower than in a low level attack.

c. Other Advantages.
(1) The first operation could be started against Ploesti as soon as sufficient aircraft are available.
(2) It is reasonable to believe that no matter what enemy action is encountered, the large force available in this theater, will succeed in reaching the target, with the almost positive assurance that a great amount of damage will be done to the target area.
(3) Any seemingly successful blow to so important an Axis objective will favorably affect the units involved, the allied, and the occupied countries.

2. Disadvantages.
a. Bombing.
(1) Accuracy on pin-points is not nearly as high as could be expected from low level.
(2) It is the general consensus that the force available is not sufficient to destroy the target in one attack.
(3) An intense concentration of flak will cause evasive action to further reduce the accuracy.
(4) Medium cloud over the target would cause an abortive mission.

b. Enemy Action.
(1) A very large concentration of heavy flak is reported in the target area.
(2) More warning will be given of the attack resulting in a more efficient smoke screen, and gun crews being better prepared.
(3) Enemy fighters will be in a better position to interfere with the attack.

c. Other disadvantages.
(1) A number of successive attacks will be made against ever-increasing opposition and will have the effect of increasing the proportion of turn-backs and losses.

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(2) A number of missions could bring the casualties up to higher than what might be expected in one successful low level mission and to nearly as high as would be incurred should the low level attack be a failure.

(3) High altitude attacks must of necessity, extend over a relatively long period of time during which groups from both the 9th and 8th Air Forces would be unavailable for missions previously planned for them.

(4) The delay in completing the required destruction may permit Germany to obtain the finished petroleum products with which she hopes to carry on her summer campaigns.

Annex A to Second Plan for Attacking Minimum Number of Targets, Ploesti Mission, AFIHI files.

Appendix 2 - Field Order No. 58, Headquarters, IX Bomber Command, 28 July 1943.

HEADQUARTERS
IX BOMBER COMMAND

APO 683, %Postmaster
New York, N. Y.
28 July 1943

FIELD ORDER NO. 58

Maps: Plotting series and topographic charts of entire area — BENGASI, CORFU, BRACOV, CONSTANTA, ISTANBUL, CYPRUS.

1. a. See Intelligence Annex.

b. Friendly ground situation: No change.

2. The Ninth U. S. Air Force will attack and destroy the 7 principal oil refineries in the PLOESTI area on 1 August 1943 employing 7 target forces in a minimum altitude attack in order to deny the enemy use of the petroleum products processed in that area.

a. ASSEMBLY: On the line Site 7 - DRIANA - TOCRA, leading element to depart TOCRA at 0530 GMT.

b. ROUTE OUT: BENGASI - TOCRA - Northern tip of CORFU - PIROT - 43°50' N 23°43'E - PITESTI - IP - Target.

ALTITUDES: BENGASI to TOCRA to 38°20' N 20°03'E begin climb so as to cross CORFU at 10,000 feet until reaching PIROT. At PIROT begin descent so as to cross DANUBE at 3,000-5,000 feet. Remain at 3,000 to 5,000 feet until reaching PITESTI. From PITESTI to IPs maintain minimum altitude above terrain. From IP to target reduce altitudes to bombing level.

c. AXIS OF ATTACK:

Target	Forces	No. 1 to 5 Incl	- 127°
"	"	Blue	- 132°
"	"	Red	- 150

d. MANEUVER AFTER ATTACK:

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Target Forces Nos 1 to 5 Incl continue on attack course 127° for following times after crossing E-W RR along southern border of PLOESTI. Then turn right to a heading of 233° to LAKE BALTA POTELEL approx 120 miles from PLOESTI.

No 1 - 2 min 15 sec
No 2 - 2 min 15 sec
No 3 - 2 min 15 sec
No 4 - 2 min
No 5 - 1 min 45 sec
Target Force Blue turn right as soon as possible to a heading of 233°.
Target Force Red turn right as soon as possible to a heading of 220°.
All forces remain at minimum altitude until after crossing RIVER DANUBE then climb to 10,000 feet.

e. ROUTE BACK:

From targets, all forces will proceed to LAKE BALTA POTELEL as directed in withdrawal plan. From there to BARKOVISTA to southern tip of CORFU to TOCRA to bases.

ALTITUDES: From target to LAKE BALTA POTELEL 3,000-5,000 feet. LAKE BALTA POTELEL climb to 10,000 feet holding this altitude until reaching CORFU. From CORFU to base utilize the most economical altitude.

3. a. Target Force No 1, Colonel Compton commanding, and consisting of 24 B-24s from the 376th Bomb Group will lead the formation and attack target No White 1 as indicated on Operations Map. Attack will be made in 4 waves of 6 airplanes each.

b. Target Force No 2, Colonel Baker commanding, and Major Brown deputy leader, consisting of 21 B-24s of the 93rd Bomb Group, will fly No. 2 position in the route formation and attack target White No II as indicated on Operations Map employing 3 waves of six airplanes each plus one wave of three airplanes.

c. Target Force No 3, Colonel Baker commanding and Major Potts leading, consisting of 12 B-24s of the 93rd Bomb Group,

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will fly No 3 position in the formation and attack target White No III as indicated on Operations Map employing 4 waves of 3 airplanes each.

d. Target Force No 4, Colonel Kane commanding, consisting of 40 B-24s of the 98th Bomb Group, will fly No 4 position in the formation and attack target White No IV employing 4 waves of 10 airplanes each.

e. Target Force No 5, Colonel Johnson commanding and Major Brandon leading, consisting of 15 B-24s of the 44th Bomb Group will fly No 5 position in the formation and attack White No V Operations Map, employing 5 waves of 3 airplanes each.

f. Target Force No 6, Lt Colonel Posey commanding, and Captain Diehl leading, consisting of 18 B-24s of the 44th Bomb Group, will fly No 6 position in the formation and attack target Blue I Operations Map, employing 3 waves of 6 airplanes each.

g. Target Force Red, Colonel Woods commanding, and Captain Caldwell leading, consisting of 24 B-24s of the 389th Bomb Group, will fly the last position in the formation and attack target Red I Operations Map, employing 8 waves of 3 airplanes each.

x. See Bomb Loading Annex.

4. See Airdrome Annex.

5. a. COMMUNICATIONS: See Communications Annex.

b. (1) Ground: No Change.
(2) Air: Colonel Compton in lead aircraft. Deputy leader, Colonel Baker, in lead aircraft 2nd Target Force.

By command of Brigadier General LEMT:

JOHN C. KILBORN,
Colonel, AC,
A-3.

* * * * * * *

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Annex 1 to Field Order No. 53

BOMB LOADING ANNEX
Target Force No. 1

1st Wave 4x1000-lb bombs with delay tail fuse from 1-6 hrs.
2nd Wave 6x500-lb bombs with delay tail fuse from 1-6 hrs.
3rd Wave 6x500-lb bombs with 45-second tail delay fuse.
4th Wave 6x500-lb bombs with 45-second tail delay fuse.

All airplanes will carry minimum of 2 boxes of British type incendiaries.

Target Force No. 2

1st Wave 4x1000-lb bombs with 1 hour tail delay fuse.
2nd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
3rd Wave 6x500-lb bombs with 45-second tail delay fuse.
4th Wave 6x500-lb bombs with 45-second tail delay fuse.

Target Force No. 3

1st Wave 4x1000-lb bombs with 1 hour tail delay fuse.
2nd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
3rd Wave 6x500-lb bombs with 45-second tail delay fuse.
4th Wave 6x500-lb bombs with 45-second tail delay fuse.

All airplanes will carry minimum of 2 boxes of British type incendiaries.

Target Force No. 4

1st Wave 4x1000-lb bombs with 1 hour tail delay fuse.
2nd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
3rd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
4th Wave 6x500-lb bombs with 45-second tail delay fuse.

All airplanes will carry minimum of 2 boxes of British type incendiaries.

Target Force No. 5

1st Wave 4x1000-lb bombs with 1 hour tail delay fuse.
2nd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
34d Wave 4x1000-lb bombs with 1 hour tail delay fuse.
4th Wave 6x500-lb bombs with 45-second tail delay fuse.
5th Wave 6x500-lb bombs with 45-second tail delay fuse.

All airplanes will carry minimum of 2 boxes of British type incendiaries.

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Target Force No. 6

1st Wave 4x1000-lb bombs with 1 hour tail delay fuse.
2nd Wave 4x1000-lb bombs with 1 hour tail delay fuse.
3rd Wave 6x500-lb bombs with 45-second tail delay fuse.

All airplanes will carry minimum of 2 boxes of British type incendiaries.

Red Target Force

First 4 Waves 4x1000-lb bombs with 1 hour tail delay fuse.
Second 4 Waves 4x500-lb bombs with 1 hour tail delay fuse, and 4 clusters American type incendiaries.
Spares 4x500-lb bombs with 45-second tail delay fuse and 4 clusters American type incendiaries.

* * * * * * * *

Annex 2 to Field Order No 58

INTELLIGENCE

1.a.(1) (a) There have been no recent reports to determine the present antiaircraft defenses of the target. Information received from sources believed to be reliable indicates that the total of heavy and medium antiaircraft guns is under 100 for the total refinery area. It is reliably reported that there are two gun positions on the roof of the railroad station directly adjacent to the Astra ROMANA oil refinery. Reliable authority asserts that one-half of the antiaircraft defense of this area has been taken over by the Germans. The same source reveals that in all probability the heavy guns are manned by GERMAN crews, whereas the medium guns are manned by Rumanians.
BALLOONS: Detailed information about balloon defenses is not available, but most recent sources of information estimate that under 100 balloons are distributed throughout the area for the defense of the refineries. These balloons are believed to be of ordinary German type and are anchored by 2.7 and 3 millimeter cables.
RDF: Enemy RDF installations are believed to be located in the valley lying east of the Danube. Expert opinion estimates that the primary function of these installations is to cover the EASTERN approach to the oilfields. The same opinion asserts that it is not possible for RDF equipment to penetrate the WESTERN mountain approach as these mountains serve to deflect the radio beam of the installations.

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SMOKESCREEN: It is reported that the enemy has made provision for laying a smokescreen across the refineries in the event of attack.
CAMOUFLAGE: Reports have been received that the enemy has endeavored to camouflage the refineries by altering the vertical appearance of the installations.
NOTE: It is estimated that the defense of this area has been calculated against attacks developing from the EAST and NORTHEAST.
Further, the layout of guns, both heavy and medium, the smokescreen and camouflage have been devised for high level day or night attacks. No information has ever been received that the enemy has made provision for a low level daylight attack coming from the WEST.

(b) It is known that there are 6 airfields in the area for the defense of the refineries. Both German and Rumanian fighter aircraft are located on these airfields. The most recent information as to fighter strengths will be received prior to the operation. It is most important to take into consideration the fact that neither fighter nor antiaircraft defenses have been in action for over a period of one year and a resultant decline of efficiency is to be expected. It has been reported that the fighter defenses of this area are divided between the German and Rumanian Air Forces.

(2) (a) The briefed course to the target has been devised to avoid all antiaircraft defenses en route. The provisional return course is similarly not across defended areas.

(b) There are no known enemy fighter airfields from the place of departure until the Danube is reached. From the Danube onward, enemy airfields have been sighted for the defense of the area. Careful watch is being kept on the current enemy order of battle in the Eastern Mediterranean. The locations and strength of enemy fighter aircraft two days before the operation will determine the route back of the mission.

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ANNEX 3 TO FIELD ORDER NO. 53 - AVAILABLE AIRDROMES

NAME	MEDICAL FACILITIES	NIGHT LIGHTING FACILITIES
MARBLE ARCH	-	C
SITE 10	Yes	-
HOSC RAUI	Yes	B
TERRIA (Site 7) (93rd Bomb Group (H))	Yes	-
BERKA (376th Bomb Group (H))	Yes	-
LETE (98th Bomb Group (H))	Yes	-
BENINA (44th Bomb Group (H))	-	-
MATRUH	Yes	C
CAIRO WEST	Yes	A*
ABUSUEIR	Yes	A
IDKU	Yes	A
ISMAILIA	Yes	C
FAYID	Yes	B
KASFARETT	Yes	C
KABRIT	Yes	B
SHANDUR	Yes	C
SHALLUFA	Yes	C
AQIR	Yes	C
LYDDA	Yes	A*
ST. JEAN	Yes	C*
ALEPPO	Yes	-
NICOSIA (Cyprus)	Yes	C*
EL ADEM	Yes	B
LG 91	Yes	C*
LG 08		A*
BAILAH (10 miles N. of Ismailia)		A*
LG 139)		
LG 159)		

*These airdromes have been alerted.

The following fields are in neutral territory and must not be used except in the greatest emergency. In which case you will be interned for the duration.

	ALTITUDE
ADANA	58 ft.
AFYON	3366 ft.
CORLU	450 ft.
ESKISCHIR	2565 ft.
KONYA	3366 ft.
CARDAK	2790 ft.
ESTIMESUT (ANKARA)	2700 ft.
AROFIYE	130 ft.
CUMAOVASI (10 miles S. of Izmir)	517 ft.

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NAME	LANDING TRACKS	LOCATIONS
MARBLE ARCH	6000'(320°)5400'(274°)4900'(344°)	30° 28' N - 18° 33' E
SITE 10	6000'(330°)	Bengasi Area
HOSC MAUI	7500'(330°)4600'(280°)4600'(206°)	Bengasi Area
TERRIA (Site 7)	6000'(334°)	Bengasi Area
BERKA	6000'(198°)6000'(190°)	Bengasi Area
LETE	5200'(280°)6000'(326°)	Bengasi Area
BENINA		Bengasi Area
MATRUH	5200'(220°)	31°18' N - 27°13' E
CAIRO WEST	6000'(345°)285°) 5200'(45°)	30°6' N - 30°55' E
ABUSUEIR	6000'(245°)	30°34' N - 32°7' E
IDKU	6000'(270°)(45°)	31°16½'N - 30°14½'E
ISMAILIA	6000'(270°)	30°36' N - 32°14' E
FAYID	6000'(0°)(270°)	30°19' N - 32°18' E
KASFARETT	6000'(0°)	30°15½'N - 32°25' E
KABRIT	6000'(315°)	30°15' N - 32°29' E
SHANDUR	6000'(0°)	30°11' N - 32°32' E
SHALLUFA	6000'(0°)	30°3½' N - 32°32½ E
AQIR	6000'(270°)	31°50' N - 34°49' E
LYDDA	6000'(281°)	32°00' N - 34°54' E
ST. JEAN	6000'(348°)6000'(286°)	32°56' N - 35°6' E
ALEPPO	6000'(273°)	36°9' N - 37°12' E
NICOSIA (Cyprus)	6000'(325°)	35°9' N - 33°16' E
EL ABEM	6000'(330°)(225°)	31°50' N - 23°55' E
LG 91	6600'(315°)	31°00' N - 29°50' E
LG 08		
BAILAH		
LG 139)		
LG 159)		31°50' N - 24°30' E

The following fields are in neutral territory and must not be used except in the greatest emergency. In which case you will be interned for the duration.

ADANA	4950 ft. 185°	35°58' N - 35°17' E
AFYON	5160 ft. 132°	38°44' N - 30°36½'E
CORLU	3300 ft. NNE/SSW	41°08' N - 27°54' E
ESKISCHIR	6900 ft. E/W	39°46½'N - 30°33½'E
KONYA	6540 ft. NNE/SSW	37°54¼'N - 32°31 3/4' E
CARDAK	6000 ft. 270°	37°48' N - 29°40' E
ESTIMESUT (ANKARA)	4500 ft. WNW/ESE	39°58½'N - 32°40' E
AROFIYE	3300 ft. 204°	40°42½'N - 30°22' E
CUMAOVASI	4464 ft. N/S	38°15' N - 27°09' E

NIGHT FLYING FACILITIES

NOTE: A - Permanent electric flare path and funnel lights. B - Portable electric flare path. C - Glim lamp flare path. D - Nil.

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DF assistance and their receivers on 4540 kcs, guarding 9Vt, this headquarters air-ground. Operators will guard, for F type messages relating to return to base, weather and diversions.

2. All aircraft will immediately return to base upon receipt of the code word Crabapple on 4540 kilocycles from 9Vt, QR7, SG1, CU9, Q3G, P8K, FBK, and FCU. Force leaders will acknowledge receipt of this message by W/T on 4540 kilocycles. Example: 9VT 9VT 9VT V QR7 QR7 QR7 RR K.

3. For the purpose of giving his return to base order aircraft of force leader will use the following call signs: White I, QR7; White 2, SG1; White 3, CU9; White 4, Q3G; White 5, P8K, Blue, FBK; Red, FCU. Normal call signs will be used for all other purposes.

4. On return from the target all receivers will be turned to 6540 kilocycles day or 3460 kilocycles night in order to pick out the particular station to which the aircraft will identify. Transmitters will remain on the emergency DF frequency until it is nedessary to change over to the identification frequency. Planes returning to the Bengasi area may keep their receivers on 4540 kilocycles until it is necessary to check in with their local ground stations.

D. The following radio facilities, in addition to those given in Standard Radio Briefing Information, are available for this operation:

1. HF/DF Stations:

STATION	COORDINATES	CALLSIGN	FREQUENCY Trans.	FREQUENCY Reg.	REMARKS
L.G. 91	30-51-00 N	J3A	6540	6540	Day
(EGYPT)	29-51-00 E	-	3460	3460	Night
DERNA	32-43-00 N	SX9	6540	6540	Day
(LIBYA)	22-41-00 E	-	3460	3460	Night
PAPHOS	34-44-00 N	T3B	6540	6540	Day
(CYPRUS)	32-27-00 E	-	3460	3460	Night
ST. JEAN	32-56-00 N	Q9J	6540	6540	Day
(PALESTINE)	35-06-00 E	-	3460	3460	Night
GAMBUT MAIN	31-55-00 N	JA3	4540	4540	Continuous
(LIBYA)	24-30-00 E	-	-	-	-

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Annex 4 to Field Order No. 53

COMMUNICATIONS

All combat crews will be thoroughly briefed on the following radio procedure to be used for Tidal Wave Operation.

A. Aircraft Returning to Bengasi area:

1. Normal W/T procedure will be used with lead aircraft checking in with their respective ground stations when 100 miles from the coast and giving the number and letter of the ships in the formation.

B. Aircraft Returning to other Area:

1. If an aircraft or formation return to an area other than Bengasi the ident procedure will be employed. The lead or single aircraft will identify by W/T when approximately 100 miles from the coast and above 3000 feet in altitude with the following procedure: Call sign of Ground Station three times V Call sign of plane three times, number of plane in formation spelled out, X696, 15 second dash, call sign of plane, K. Example: 91X 91X 91X V ABCD ABCD ABCD three X696 _____ABCD K.

2. Aircraft returning to the following areas will ident to stations given below:

Area Returning to	Station Frequency DAY	NIGHT	Call sign	Location
CYPRUS	6540	3460	T3B	PAPHOS, CYPRUS
LEVANT	6540	3460	Q9J	St Jean, PALESTINE
EGYPT	6540	3460	J3A	L.G. 91, EGYPT
GAMBUT-EL ADEM	6540	3460	A7X	GAMBUT, Libya
TRIPOLI	6540	3460	75X	MISURATA, LIBYA

C. Guard Procedure:

1. En route to the target all aircraft will have their transmitters on 4575 kilocycles day or 3105 kcs night for emergency

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2. Airdrome Control Stations:

STATIONS	CALLSIGN	FREQUENCY TRANS.	FREQUENCY REC.	REMARKS
GALBUT MAIN	BEEFSTEAK	6440	6440	Continuous
(L.G. 139)	-	-	-	-
GALBUT No. 5	POTASH	6440	6440	Continuous
(L.G. 139)	-	4135	4135	Continuous

3. Radio Beacon:

STATION	COORDINATES	CALLSIGN	FREQUENCY	REMARKS
GALBUT MAIN	31-55-00 N	BC	450	Continuous
(L.G. 139)	24-30-00 E	-	-	-

Appendix 3 - Citations for the Awards of Congressional Medals of Honor

Colonel Leon W. Johnson, Air Corps, United States Army. For conspicuous gallantry in action and intrepidity at the risk of his life above and beyond the call of duty on 1 August 1943. Colonel Johnson, as commanding officer of a heavy bombardment group, led the formation of the aircraft of his organization constituting the fourth element of the mass low level bombing attack of the Ninth United States Air Force against the vitally important enemy target of the Ploesti oil refineries. While proceeding to the target on this 2,400-mile flight his element became separated from the leading elements of the mass formation in maintaining the formation of the unit while avoiding dangerous cumulous cloud conditions encountered over mountainous territory. Though temporarily lost he reestablished contact with the third element and continued on the mission with this reduced force to the prearranged point of attack, where it was discovered that the target assigned to Colonel Johnson's group had been attacked and damaged by a preceding element. Though having lost the element of surprise upon which the safety and success of such a daring form of mission in heavy bombardment aircraft so strongly depended, Colonel Johnson elected to carry out his planned low level attack despite the thoroughly alerted defenses, the destructive antiaircraft fire, enemy fighter airplanes, the imminent danger of exploding delayed action bombs from the previous element, of oil fires and explosions, and of intense smoke obscuring the target. By his gallant courage, brilliant leadership, and superior flying skill, Colonel Johnson so led his formation as to destroy totally the important refining plants and installations which were the object of his mission. Colonel Johnson's personal contribution to the success of this historic raid, and the conspicuous gallantry in action, and intrepidity at the risk of his life above and beyond the call of duty demonstrated by him on this occasion constitute such deeds of valor and distinguished service as have during our nation's history formed the finest traditions of our armed forces. Residence at appointment: Moline, Kansas. [G.O. No. 54, 7 Sep. 1943]

Colonel John R. Kane, Air Corps, United States Army. For conspicuous gallantry in action and intrepidity at the risk of his life above and beyond the call of duty on 1 August 1943. On this date he led the third element of heavy bombardment aircraft in a mass low level bombing attack against the vitally important enemy target of the Ploesti oil refineries. En route to the target, which necessitated a round trip flight of over 2,400 miles, Colonel Kane's element became separated from the leading portion of the massed formation in avoiding dense and dangerous cumulous cloud conditions over mountainous terrain. Rather than turn back from such a vital mission he elected to proceed to his target. Upon arrival at the target area it was discovered that another group had apparently missed its target and had previously attacked and damaged the target assigned to

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Colonel Kane's element. Despite the thoroughly warned defenses, the intensive antiaircraft fire, enemy fighter airplanes, extreme hazards on a low level attack of exploding delayed action bombs from the previous element, of oil fires and explosions and dense smoke over the target area, Colonel Kane elected to lead his formation into the attack. By his gallant courage, brilliant leadership, and superior flying skill, he and the formation under his command successfully attacked this vast refinery so essential to our enemies' war effort. Through his conspicuous gallantry in this most hazardous action against the enemy, and by his intrepidity at the risk of his life above and beyond the call of duty, Colonel Kane personally contributed vitally to the success of this daring mission and thereby rendered most distinguished service in the furtherance of the defeat of our enemies. Residence at appointment: Shreveport, Louisiana. /G.O. No. 54, 7 Sep. 1943/

Lieutenant Colonel Addison E. Baker, 0-280827, Air Corps, United States Army. For conspicuous gallantry and intrepidity above and beyond the call of duty in action with the enemy on 1 August 1943. On this date he led his command, the 93d Bombardment Group (H), on a daring low level attack against enemy oil refineries and installations at Ploesti, Rumania. Approaching the target his aircraft was hit by a large calibre antiaircraft shell, seriously damaged, and set on fire. Ignoring the fact he was flying over terrain suitable for safe landing, he refused to jeopardize the mission by breaking up the lead formation and continued unswervingly to lead his group to the target upon which he dropped his bombs with devastating effect. Only then did he leave formation, but his valiant attempts to gain sufficient altitude for the crew to escape by parachute were unavailing and his aircraft crashed in flames after his successful efforts to avoid other planes in formation. By extraordinary flying skill, gallant leadership, and intrepidity Colonel Baker rendered outstanding, distinguished, and valorous service to our Nation. /G.O. No. 20, 11 Mar. 1944/

Major John L. Jerstad, Air Corps, United States Army. For conspicuous gallantry and intrepidity above and beyond the call of duty. On 1 August 1943, he served as pilot of the lead aircraft in his group in a daring low level attack against enemy oil refineries and installations at Ploesti, Rumania. Although he had completed more than his share of missions and was no longer connected with this group, so high was his conceptions of duty that he volunteered to lead the formation in the correct belief that his participation would contribute materially to success in this attack. Major Jerstad led the formation into attack with full realization of the extreme hazards involved and despite withering fire from heavy and light antiaircraft guns. Three miles from the target his airplane was hit, badly damaged, and set on fire. Ignoring the fact he was

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flying over a field suitable for a forced landing, he kept on the course. After the bombs of his aircraft were released on the target, the fire in his ship became so intense as to make further progress impossible and he crashed into the target area. By his voluntary acceptance of a mission he knew was extremely hazardous, and his assumption of an intrepid course of action at the risk of life over and above the call of duty, Major Jerstad set an example of heroism which will be an inspiration to the armed forces of the United States. /G.O. No. 72, 28 Oct. 1943/

Second Lieutenant Lloyd H. Hughes, O-666292, Air Corps, United States Army. For conspicuous gallantry in action and intrepidity at the risk of his life above and beyond the call of duty. On 1 August 1943 Lieutenant Hughes served in the capacity of pilot of a heavy bombardment aircraft participating in a long and hazardous minimum altitude attack against the Axis oil refineries of Ploesti, Roumania, launched from the northern shores of Africa. Flying in the last formation to attack the target, he arrived in the target area after previous flights had thoroughly alerted the enemy defenses. Approaching the target through intense and accurate antiaircraft fire and dense balloon barrages at dangerously low altitude, his airplane received several direct hits from both large and small caliber antiaircraft guns which seriously damaged his aircraft, causing sheets of escaping gasoline to stream from the bomb bay and from the left wing. This damage was inflicted at a time prior to reaching the target when Lieutenant Hughes could have made a forced landing in any of the grain fields readily available at that time. The target area was blazing with burning oil tanks and damaged refinery installations from which flames leaped high above the bombing level of the formation. With full knowledge of the consequences of entering this blazing inferno when his airplane was profusely leaking gasoline in two separate locations, Lieutenant Hughes, motivated only by his high conception of duty which called for the destruction of his assigned target at any cost, did not elect to make a forced landing or turn back from the attack. Instead, rather than jeopardize the formation and the success of the attack, he unhesitatingly entered the blazing area and dropped his bomb load with great precision. After successfully bombing the objective, his aircraft emerged from the conflagration with the left wing aflame. Only then did he attempt a forced landing, but because of the advanced stage of the fire enveloping his aircraft, the airplane crashed and was consumed. By Lieutenant Hughes' heroic decision to complete his mission regardless of the consequences, in utter disregard for his own life, and by his gallant and valorous execution of this decision, he rendered a service to our country in the defeat of our enemies which will be everlastingly outstanding in the annals of our nation's history. /G.O. No. 17, 26 Feb. 1944/

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Appendix 4

ROSTER OF OFFICERS AND ENLISTED MEN
WHO FLEW THE PLOESTI MISSION, 1 AUGUST 1943*

Brigadier General Uzal G. Ent

Colonels

Compton, Keith K.
Johnson, L. W.
Kane, John R.
Wood, J. W.

Lieutenant Colonels

Baker, Addison E.
Beightol, Willis E.
Bleyer, Julian N.
Posey, James T.

Majors

Anderson, William N.
Appold, Norman C.
Beam, James C.
Brandon, William H.
Brooks, John A.
Brown, George S.
Cross, Adelbert D.
Dessert, Kenneth O.
Hahn, Delbert H.
Hodge, Dexter L.
Jerstad, John L.
McBride, Ralph J., Jr.
Potts, Ramsey D., Jr.
Shingler, Herbert I., Jr.
Tate, Joseph S., Jr.
Yaeger, William H., Jr.

Captains

Ardery, Philip P.
Baker, Edwin C.
Bennett, Thomas W.
Brown, Llewellyn L., Jr.
Bunker, Walter I.
Caldwell, Kenneth H.
Cameron, William R.
Colchagoff, George D.
Conroy, Thomas C.
Culpepper, Claude A.
DeVinney, James F.
Diehl, John H., Jr.
Epting, Jacob B.
Ferguson, Clay V.
Gentry, Rowland H.
Gerrick, Clarence W.
Gunn, James A., Jr.
Harvey
Herbert, Kenneth G.
Hicks, Doyle
Holmes, Walter T., Jr.
Houston, Rowland B.
Jarvis, Harry L., Jr.
Jones, Jack S.
Merrill, Charles T.
Miller, Robert E.
Mooney, Robert C.
Phillips, Reginal H.
Rantala, Archibald J.
Roche, John R.
Roper, Hugh R.
Spencer, Lyle A.
Strong, W. H.
Taylor, Wallace C.
Thompson, Ralph P.
Ward, Emery M.
Wicklund, Harold A.

* The absolute accuracy of this list cannot be vouched for. It is based on the Sortie Reports of the Mission.

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First Lieutenants

Ahlquist
Alexander, David W.
Allen, Ronald S., Jr.
Anderson, Everett P.
Antonio, B.
Arens, Herbert W.
Austin, Horace W., Jr.
Austin, Robert H.
Avendano, Joseph
Baker, Harry J.
Banks, William D.
Barrett
Barthel, Carl C.
Barwell
Bilyeu, Hal E.
Black
Blackis, John T.
Blevins, Hilary H.
Bley, Charles W.
Bloom, Irving C.
Bock, James
Braly, Roy E.
Brannon, Ted
Butler, Richard D.
Carpenter, Reginald L.
Chadwick, Jefferson S.
Clark, George L.
Clements, Joseph B., Jr.
Collins
Comey, Richard J.
Conn, Myron R.
Corn, Joel I.
Dabney, William C., Jr.
Dailey
Darlington, Julian T.
Deeds, James A.
Demont, Russell D.
Denton, William J.
DeFreville, Paul C.
Deveuve, J. P.
Dick, Thomas C.
Dickson, Howard L.
Dieterle, Jack W.
Dore, John J., Jr.
Drakoulas, Homer
Duffy, Edward G.
Dufour, Jerome P.
Edwards, Robert L.
Ellis, Lewis H.
Ellison, Cox B.
Emmons
Felber, Robert E.
Finneran, Joseph E.
Fino, John A.
Fisher, Harold A.
Flaherty, Joseph E.
Flavelle, Brian W.
Fogel, Ernest W.
Ford, Herrel E.
Fowble, Edward L.
Franks, Worthington A.
Fravega, Thomas P.
Freeman, Albert V.
Freese
Gallagher, Raymond T.
Gaston, Allen B.
Gekas, John N.
Geron, Alva J.
Gill, Theodore N., III
Gill, James H.
Girard, Louis V.
Gluck, Edwin L.
Goldberg, Jerome J.
Good, Arnold H.
Gooden, Clarence W.
Gray, Kenneth C.
Grigg, Warren H.
Guillermin, John L.
Hadcock, Lawrence (NMI)
Hadley, Gilbert B.
Hammond, George E.
Hansen, Kermit P.
Harms, Roy C.
Haworth, Carl O.
Helin, Theodore E.
Henderson, Charlie P., Jr.
Hester, Albert L.
Hickman, Cleveland D.
Hill, James E., Jr.
Hinch, Ralph V.
Hinchman, Howard R.
Hines, Wilfred E.
Hobbs, Charles L.
Holloway, Lloyd E., Jr.
Holt, G. E., Jr.
Horton, Robert W.
Hubbard, Maynard G.
Hubbard, Raymond B.
Huberty, Joseph S.
Hughes, Charles E.
Hughes, William D.

First Lieutenants

Hulpiau, George E.
Hunn, Spencer S.
Hunt, John G.
Hurd, Donaldson B.
Hurd, Earl C.
Hurd, Richard F.
Hussey, Lindley P.
Huston, James S.
Hyde, Thomas I.
Iovine, G.
Irby, Shelby L.
James, Harold L.
Janic, Edmund F.
Jansen, George R.
Johnson, Donald G.
Jones, Fred H.
Kaboth, Jack W.
Kemp
Kendall, Harold K.
Kendall, Jimmie W.
Kielt
Klekar, Howard R.
Lamberts, Robert K.
Lanning, Jack B.
Larson, R. A.
Lasco, Henry A., Jr.
Latane
Laudig, Harold J.
League, Miles R.
Lear, Dean E.
Lebrecht, Royden L.
Lee, Stanley
Lehnhausen, Robert J.
Leimbach, Bernard E.
Light, Herbert M.
Lipton, David
Little, William K.
Long, Worthy A.
Looker, Carl S.
McAtee, James C.
McAtee, John E.
McCollum, Homer S.
McCormick, John B.
McDonald, John O.
McDonald, Olin K.
McFarland, Kenton D.
McGraw, John J.
McKittrick
McLaughlin, Frank B.
Madden, L. J.
Martin, John C.
Martin, Roy G.
Matson, Kenneth H.
Mattingly, Joseph B.
Mays
Merrick, James L.
Meyer, G. Raymond
Miller, James
Miller, Richard T.
Miller, Vernon L.
Mitchell, Edward R.
Moran, Homer L.
Morgan, LeRoy B.
Moss, Benjamin M.
Murphy, Lawrence E.
Nading, William D.
Nagy, Joseph L.
Nathe, Raymond J.
Naum, Albert C.
Neef, Melvin E.
Neeham, William E.
Neeley, Samuel R.
Newbold, William P.
Nicholson, Robert G.
Nowak, Nathan
O'Brien, John P., Jr.
Olliffe, Victor R.
Olsen, Stanley F.
Opsata, Andrew W.
O'Reilly, Robert J., II
Ormsbee, Albert G.
Orr, Daniel B.
O'Sullivan, Donald R.
Palm, John D.
Palmer, Frederick H.
Park, John C.
Parker, Charles M.
Parshall, Joseph W.
Peterson, Alan E.
Peterson, Robert C.
Pettigrew, Wesley M.
Pezzella, Alfred W.
Phillips, Philip P., Jr.
Podolak, Stanislaw J.
Porter, Enoch M., Jr.
Price, R. Y.
Reinhart, Elmer H.
Reuter, George J., Jr.
Reynolds
Rich, Hosea W.

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First Lieutenants

Rodenberg, Elmer R.
Rothkrug, Edward (MMI)
Rudgers
Rumsey, Jack H.
Ryan, Lyme T.
Scarlett, Theodore B.
Schuler
Schwartz, Max H.
Schwellinger, Robert W.
Scott, Henry W.
Scrivner, Thomas E.
Shannon, Eunice M.
Shaw, Charles M.
Silverman, Joel L.
Sisson, Dale L.
Skembaro, Hubert
Slough, Frank D.
Smith, Richard B.
Snow, Kenneth F.
Speiser, Martin A.
Spurrier, Chester E.
Stamper
Stampolis, Nicholas
Steeg, James R.
Stein, William F.
Sternfels, Robert W.
Stevens, Gordon S.
Stewart, Walter T.
Stine, Robert J.
Stoddard, Moreau E.
Stokes
Stormer, Julius A.
Storz, Robert H.
Sulflow, August W.
Teltser, Milton
Thomas, John B.
Tolleson, James F.
Triantafellu, Rockley
Turner, Claude A.
Underwood, Glen W.
Vengelen, Ray F.
Vickary, Eugene P.
Walker
Wallace, Charles N.
Ward, John V.
Watt, David S.
Weaver, Worden
Weir, Edward E.
Weiss
Welch, James W., Jr.
Westerbeke, Donald G.
Westlund, Sidney
Whipple, Harlen D.
White
White, John B.
Whitener, Cecil J.
Whitlock, Charles A.
Whitlock, Hubert H.
Wilkinson
Wilkinson, Richard L.
Williamson, Richard C.
Wilson, George H.
Wilson, J. D.
Wilson, Robert F.
Winger, George W.
Womble, Hubert H.
Wood, Jack K.
Wright, Frank C.
Wright, Robert L.
Yerman
Young, John S.
Zaruba, Leroy E.
Zimmerman, William R.
Zwicker, Henry R.

Second Lieutenants

Adams, Norman C.
Aronson, Albert H.
Ayers, John T.
Barbour, Charles C.
Bargemann, Allen G. E.
Barnett, Edward
Bassett, Wilmer H. C.
Beaumont, Willard R.
Bergan, Bill J.
Bernard, Albert F.
Bilby, Bedford B.
Binder, Glenn W.
Bird, Luther C.
Bird, Robert R.
Bowyer, Robert H.
Brackendorff, Melvin C.
Brinton, George A.
Britt, Richard W.
Butler, Cecil W.
Buxton, Grover H.
Campbell, Thomas C.
Campbell, William J.

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Second Lieutenants

Canfield, Ivan
Cavitt, Charles D.
Christensen, Horace H.
Cilli, Nicholas G.
Cochran, D.
Coleman, Richard C.
Collins, Elwood E.
Collison, James H.
Colvin, John R.
Courtney, Robert E.
Crawford, Cecil C.
Crump, Harry Clay, Jr.
Cummings, John F.
Cummings, Ralph W.
D'Adamo, B. Domenick
Dahl, Donald R.
Daily, Wendell L.
DeArmond, Donald A.
DeBusk, William R.
Decker, Donald R.
DeCoito, Anton R.
DiCosol, Don N.
Dobson, Edward M.
Dukate, Elbert L., Jr.
Edwards, Hover
Egan, William J., Jr.
Egle, Ralph W.
Ellison, Joe A.
Emerson, Elwood R.
Engkie, Carron W.
Engelhardt, Jack B.
Epp, Daryl E.
Everhart, George C.
Fabiny, Andrew T.
Fager, Callistus E.
Faulkner, James H.
Fears, J.
Felix, Jose R.
Ferguson, Earl F.
Finder, Sheldon
Fisher, Richard L.
Fisher, Robert L.
Fitzsimmons, William V.
Flaherty, T. A.
Flesch, Anthony W.
Foley, John P.
Fontenrose, John R.
Foster, Clifton C.
Fox, James A.
Franklin, Russell A.
Franks, Jesse D.
Fretwell, Lloyd G.
Friberg, Wayne V.
Gambrill, Jean W.
Gebhard, Norbert N.
Gerrits, James F.
Giblin, George F.
Gillette, Major R.
Gilliat, William R.
Gioana, Guido
Godde, Russell H.
Goodnow, Edward W.
Gover, James S.
Green, Alan J.
Green, Allen H.
Gregory, Whitney I., Jr.
Gregg, Harry W.
Greybill, Robert C.
Grimes, George G.
Hall, William L.
Hamilton, Kenneth D.
Hamilton, Otis T.
Hamlin, Kitteridge
Hammons, James W.
Hamlyn, Raymond E.
Harris, Robert A.
Harth, William H., Jr.
Hause, Maurice E.
Havens, William S.
Hawk, Preston M.
Hawkins, Earl V.
Holder, Ronald D.
Henslee, Herman H.
Hermanowski, John J.
Hexberg, Casper J.
Heyer, Edwin H.
Holbrook, Charles T.
Hollingsworth, Edwin C.
Hoover, James K.
Howard, Charles H.
Huber, John J., Jr.
Huddle, John R.
Huffman, Charles A.
Hughes, George T.
Hughes, Lloyd H.
Hull, Charles T.
Huntley, Beverly S.
Hyde, Robert H.
Iphar, Claude H.
Israel, Carl T.

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Second Lieutenants

Jackson, Barney
Jenkins, Donald (NMI)
Johnson, Arthur H.
Johnson, Robert J.
Johnston, Kenneth F.
Katz, Theodore
Keaney, Frank W., Jr.
Kennedy, Michael G.
Kill, Joseph F.
Killian, Clinton H.
King, John F.
Kingman, Walter L.
Kinkaid, Lorin E.
Klinkbeil, Julius K.
Klinghoffer, Leon
Korger, Harold F.
Kotkin, Izaac
Kraft, John E.
Krug, Richard M.
Kuhlmann, Gerald H.
Kullman, Martin L.
Kurtz, Charles H.
Kyer, Gilbert H.
LaLonde, Howard J.
Lancashire, Lawrence S.
Larsen, Victor H.
Larson, Carl H.
Lascurettes, George A.
Lemke, Adelbert J.
Lewis, David M.
Lewis, Jack M.
Liscomb, Russell P.
Lockhart, John O.
Longnecker, Russell D.
Love, William F.
MacDonald, John A.
McCaffery, Robert A.
McCandless, George, Jr.
McCarty, Ned
McCash, David E.
McClain, James H.
McClellan, Francis A.
McDonough, John M.
McFarland, Torrence H.
McGehee, James H.
McGrain, Thomas W.
McGuire, Edward T.
McIntire, M. C.
McLoughlin, John A.
McMullen, William R.
McNamara, David A.
McNeil, William H.
Mackey, Walter E.
Makin, George J., Jr.
Markham, Claron E.
Marquis, James E.
Marrah, James H.
Martin, George P.
Martin, George T.
Mason, Harley B.
Mason, Robert E.
Mathers, Mark J., Jr.
Meador, Stell
Mendelsohn, Marvin R.
Merrell, Robert W.
Michaels, Willard L.
Michener, Byron R.
Mickish, Albert J.
Middleton, Wayne H.
Millar, Philip (NMI)
Miller, Clyde E.
Minogue, John F.
Moedinger, Harry E.
Montemurro, Francis V.
Moore, Harold B.
Moore, Harold G.
Moore, Joseph F.
Morgan, James R.
Mosco, Marvin
Mullins, Daniel J.
Munroe, Stewart
Murray, Robert C.
Nash, Robert D.
Nelson, Milton
Nelson, Philip E.
Newman, Herbert J.
Nicholson, Louis M.
Nolan, James F.
Norman, Lawrence C.
Norton, Donald A.
Oakley, Warren W.
Pace, John R.
Pakos, Anthony R.
Palmtag, Herbert M.
Papish, Philip G.
Parker, Oscie K.
Patch, Dwight D.
Paul, Daniel W.
Pear, Sidney A.
Pendleton, Richard H., Jr.

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Second Lieutenants

Perkins, Ralph F., Jr.
Phifer, Forrest H.
Phipps, W. H.
Piccolo, Anthony J.
Polaschek, David A.
Polisky, Harold L.
Poulson, Ernest L.
Powell, John E.
Price, Hillard S.
Price, Robert V.
Quigley, Joseph H., Jr.
Reback, Sanford A.
Redding, Rylan C.
Reese, William L.
Reid, James W.
Reiter, Jack
Reynolds, William J.
Richards, Dean B.
Ricks, R. A.
Rispoli, Anthony
Roach, Jack M.
Robison, Robert A.
Roches, Louis A., III
Rodgen, Eugene L.
Roman, George G.
Romano, Albert A.
Ronsberg, Lester H.
Roodman, Harold
Root, Carl F.
Ross, Norman A.
Rotundo, Joseph T.
Ruecroft, Richard C.
Rumsey, Edward L., Jr.
Rutledge, William H.
Ryan, John C.
Samoski, Stanley J.
Sargent, Everett E., Jr.
Savage, Harry R.
Savaria, Jerome D.
Sayre, Fred E.
Scarborough, Theodore F.
Schaufele, Howard A.
Schlenker, LeRoy F.
Schminke, Robert S.
Schrampf, William M.
Schwab, H. W.
Scott, William
Scriven, Dale R.
Seibert, Gordon D.
Selasky, Charles J.
Selvidge, William M.
Senff, Robert J.
Shay, Anel B., Jr.
Shouse, Allen V.
Shryock, Thomas J.
Shuler, Quentine E.
Shuler, Thomas H.
Siegal, Gilbert
Siegfried, William E.
Simpson, Robert V.
Slessor, Lee D.
Sloss, Richard N.
Smith, Robert D.
Smithdeal, Edward O., Jr.
Snetting, Leverne H.
Snyder, Robert E., Jr.
Soloff, Isarel
Solomon, Herbert
Sorensen, Walter M.
Souza, Joseph L.
Staehle, John F.
Stahl, Albert W.
Stallings, John B.
Stenborn, Harry W.
Stephens, Robert C.
Stewart, George A.
Stewart, Theodore C.
Stilwell, Lewis B.
Storms, Leon M.
Strickbine, Edward
Stulting, Eldon R.
Sullivan, Joseph P.
Sundstrom, Richard C.
Supiano, Boyden
Sweet, Adolphus J.
Swenson, Berthel
Sykes, William W.
Tabscoff, Harold
Tabb, Clarence E., Jr.
Talas, Ralph L.
Taylor, James G.
Tegnazian, Albert
Temple, George W.
Theis, Robert
Thompson, Arthur W.
Timmer, Robert
Timpo, Peter A.
Titkemeyer, Charles W.
Todd, Robert E.
Tokes, William

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Second Lieutenants

Tomorkosky, Joseph
Totten, Gerald J.
Travis, Leo G.
Trouve, Louis V.
Tubb, Walter F.
Valcik, Stanley
Vaden, Preston E.
Verberg, Merlin H.
Victor, Jerome S.
Viers, John W.
Walker, Robert A.
Walls, Daniel H.
Ward, Robert G.
Ware, Warren H.
Warner, Raymond P.
Warner
Warren, Charles K.
Warrenfeltz, Paul H.
Watkins, Chaplin J.
Weant, Willie B.
Weekly, Pharis F.
Weijanen, Oeva O.
Weinberg, Charles W.
Weisler, Francis A.
Werts, Stanley R.
Whalen, Norman H.
Whitaker, Coleman S.
Winchester, John K.
Wood, Richard A.
Wright, William E.
Wright, William M.
Wyatt, James L.
Young, James D.
Young, Joseph J.
Young, Robert E.
Zink, Grover A.

Flight Officers

Anderson, Andrew L.
Avery, Richard H.
Baum, Thomas G.
Boswell, Joe S.
Cnozelski, Michel
Collins, Nelson R.
Conley
Fribley, Donald E.
Gentry, Homer S.
Glifford, T. A.
Jones, Donald K.
Koon, Loren J.
Krause, William J.
Lacombe, Raymond J.
Lindsey, James R.
Milliner, Joseph E.
Mordovangy, Andrew
Myres, Max M.
O'Grady, James E.
Olsen, Odin C.
Packer, Paul W.
Podgurski, Henry A.
Prather, William H.
Quaglino, Louis R.
Rose, Virgil
Saladiak, John
Salyer, Charles A.
Satterlund, Carl S.
Smith, Charles E.
Starr, Charles L.
Thompson, Douglas W.
Walker, Albert J.
Young, Charles S.

Master Sergeants

Mease, David D.
Shorn
Slade, Robert W.
Smith, Robert M.
Wierciszewski, Raymond C.

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Technical Sergeants

Aguayo, George
Ahola, Carl R.
Altman, John T.
Altsnuler, Dave
Anchando, Rudolph O.
Anderson, Fred E.
Badida, Nicholas
Baird, Robert L.
Bale, Jewett A.
Bassett, Lloyd M., Jr.
Bauman, Francis A.
Beaudry, Theodore C.
Bennett, Charles E.
Bergkamp, Alfred B.
Berry, Robinson B.
Beuter, Oren A., Jr.
Block, Harold
Bonorden, Ellis J.
Boullioun, Bernard M.
Boyle
Brackman, Edgar W.
Brazon, Walter
Brishi, Lloyd W.
Brown, Johnnie
Brown, Paul M.
Brown, Stuart C.
Brumagin, Deloros R.
Burke, Charles A.
Burton, Russell E.
Byers, Richard G.
Callahan, Curtis W.
Callier, James E.
Cannon, Charles J.
Carroll, John H.
Chase, P. V.
Clarkston, John H.
Clay, Herman C.
Cleveland, John H.
Coll, William F.
Connolly, John E.
Cooper, Harold E.
Cooper, Robert J.
Craddock, Daniel A.
Crampton, Harry W.
Creighton, James H.
Cross, Frank E.
Cyoulski, Walter
Davis, Melvin H.
Davis, Thomas E.
Dayberry, John J.
Decamp, Marcus A.
DeLaloire, John B., Jr.
Dent, William M.
Dillman, Plase B.
Domke, Carl A.
Dzadyk, John
Easterling, Silas W.
Eshelman, Paul F.
Farnam, John K.
Farrell, George B.
Ferrel
Fisher, Louis G.
Fitzgerald, Mack
Flesher, Isaac A.
Flynn
Folks, Lowell A.
Ford, Howard O.
Fowler, Lloyd T.
Foy, James J.
Francoeur, Lucien P.
Franklin, Albert D.
Fravega, Anthony T.
Fry, Clyde C.
Fulfer, George W.
Garrett, Charles E.
Garrett, Frank D.
Gerhart, Bill G.
Glitzer, Paul H.
Golec, Walter A.
Gomillion, Elton L.
Goodman, Earl E.
Goodson, Walter H.
Gorman, D. W.
Gough, Ernest E.
Greeley, Bruce P.
Greenhalgh, Arthur D.
Gregory, Cornelius K.
Grimes, Donald J.
Grow, Robert E.
Guilford, George W.
Gutknecht, Wilbur S.
Hale, James B.
Hamel, Edgar O.
Hammond, Roy D.
Hanlon, Melvin F.
Hayes, John J.
Herlevic, Frank A.
Higgins, Bernard A.
Hinely, Jesse L.
Hoffman, Virgil L.

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Technical Sergeants

Holland, John E.
Holroyd, George K.
Holtz, C. H.
Hommick, Frederick H.
Honeyman, George H.
Howie, James M.
Huenerberg, Vincent E.
Hulsey, Dale G.
Huneke, Gustave C.
Ingram, Donald H.
Irwin, John F.
Jackson, Dewey O.
Jacot, Paul F.
Jennings, Burnett
Jett, Joseph W. B.
Johnson, Elijah D.
Johnson, Robert H.
Johnson, Vernie F.
Johnston, Turner Y.
Johnston, Woodrow W.
Jones, John P.
Jordan, William G.
Joswick, Jerry J.
Joyce, Paul A.
Just, Frank
Kase, Louis H.
Kasparian, Jack W.
Kees, Frank D.
Kelly, Fay L.
Kennon, Dan
Kettering, Doll W.
Kiefer, Norman C.
Kintantas, Charles
Klingle, Henry A.
Knotts, Harold G.
Kobler, James K.
Kofoed, James P.
Konecny, Harry G.
Krause, Harry C.
Kretzer, Harold
Krugel, Stanley S.
Landry, Joseph A.
Laskowski, Thomas A., Jr.
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Leising, Frank H.
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Livingston, Jules E.
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Lower, Max W.
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Lubin, Alex
Lucas, Bernard P.
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McAdams, Robert C.
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McDonnell, Martin J.
McKee, Richard J.
McNair, Robert W.
McWhirter, Oscar F.
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Martin, Prince A.
Mason, Gerald D.
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Mead, Robert F.
Mechanic, Bernard
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Mix, Joseph E.
Monfort, J.
Moore, V.
Morgan, John W.
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Neeper, Loy L.
Nelson, Clarence W.
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Nicholson, Paul A.
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Norris, Frank A.
Norwood, Ples W., Jr.
Opp, Harry C.
Orr, Warren A.
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Paolillo, Michael A.
Parker, Earl R.
Parks, R. E.
Pate, Leonard S.
Paulsen, Earl J.
Pemberton, Leon D.
Petrie, Louis M.
Petty, Dale E.
Pinson, J. C.
Piper, Ernest B.
Pitcoveck, John
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Popham, William L.
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Oberste, Marcellus L.
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O'Hara, John P.
Ohlmeyer, Paul L.
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Osborn, Donald J.
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Oser, Albert H.
Pace, Harold L.
Packer, Stanley L.
Paliga, Frank
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Parker, George H.
Parramore, George H.
Passalacqua, Peter C.
Paulin, Leopold J.
Payne, Elbert E.
Pearson, Edgar J.
Peidl, Anthony J.
Perry, Alton H.
Perry, Clayton L.
Peterleus, Arthur W.
Petri, Norbert I.
Petty, Jack
Phillips, Charles H.
Picard, Leo J.
Pierce, Donald G.
Pimlott, Donald A.
Pirm, William G.
Pitak, Bronislaus C.
Poe
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Potts, John M.
Potvin, John S.
Preite, Louis
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Ramey, John T.
Ramsey, Ivan W.
Rangel, Manuel R.
Rans, Robert
Rauba, Anthony J.
Reasoner, Robert J.
Reed, Charles A.
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Regan, Edward B.
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Remley, Milton P.
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Rice, Earl D.
Riddle, Alpheus H.
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Riffe, Bill M.
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Robertson, Dallas A.
Robins, Ralph M.
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Rodriguez, Frank L.
Rose, James E.
Ross, John R.
Rowland, Daniel W.
Ruark, Charles R.
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Russell, David A.
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Salsbury, Richard G.
Sands, Edward A.
Sandish, Conrad A., Jr.
Satterfield, Channing H.
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Savattiere, Anthony J.
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Schoer, Walter B.
Schuster, Harold L.
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Scollin, Victor E.
Scott, George W.
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Seigfeldt, Herman J.
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Shepherd, Lloyd E.
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Skrovig, Sylvannus O.
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Smith, Edmond H.
Smith, Lavelle
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Smith, Malcolm G.
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Snyder, Clay E.
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Stachow, Benny S.
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Stephens, L. J.
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Wargo, Stephen
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O'Leary, Thomas (MMI)

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