Commodore 64 KEYBOARD:

(+) Increases engine power up to a maximum of 9

(−) Decreases engine power down to a minimum of 1

(F) Lowers flaps down to a minimum of 40

(R) Raises flaps up to a maximum of 0

(1) Feathers engine #1

(2) Feathers engine #2

(3) Feathers engine #3

(4) Feathers engine #4 (Feathering will streamline to reduce drag. Engines that are losing oil or have lost power should be feathered. Once an engine has lostt oil, it cannot be feathered.)

(D) Lowers landing gear

(U) Raises landing gear

(A) Accelerates time by increments of 2 to speed up the game. Maximum increase is times 60.

(Q) Toggle warning messages off and on. Can be used to eliminate the auto-reduction to slowest time when a warning is given.

(f2) Will abort a take off or mission. When a mission is aborted, the rest of the group will bomb without you. Such bombing is inaccurate and some planes are lost to combat.

(O) Opens bomb bay doors to permit bombing and turns on bombsight

(S) Drops bombs

(C) Closes bomb bay doors

(f8) Bail out (if over land and at least 500 feet above it)

(SPACE) Pauses game when hit. Restarts game when hit again.

(N) Calls for coordinate and time information from navigator and shows game map

(E) Calls for fuel and formation information from engineer

(Z) Accelerates game to fastest speed (X 60) immediately

★ FLIGHT SIMULATOR ★

B-24

★ COMBAT SIMULATOR ★

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B-24: Liberators Over Ploesti

Introduction

B-24 is a simulation of the 19 missions against the Ploesti oil refineries, some of which were flown by the 460th Bombardment Group from its airfield in Spinazolla, Italy. As the major supplier of oil for the Nazi war machine, Ploesti was one of the most heavily defended targets in Europe. More bombers were downed by flak over Ploesti than over any other target in the war.

B-24 is a simulation on several different levels. As you play the game, you will be performing the tasks of pilot, copilot, navigator, engineer, and bombardier. As the crew of the lead Liberator, you will determine the flight path, speed, altitude, and bomb drop point for an entire bomber formation. As the representative of all the air forces in the game, your performance will set the effectiveness of the 460th Bombardment Group, 55th Bomb Wing, 15th Air Force, and all of the other formations, groups, wings, and air forces which attacked Ploesti.

(Ploesti was only one of the targets bombed by the 460th. As an item of gaming and historical interest, a copy of some of the information given to the crews for the actual Ploesti bombing is included in the Air Objective Folder.)

The B-24 Liberator was produced in greater numbers with more variants than any other U.S. aircraft in World War II. It was used over a longer period of time and in more theatres of operation than any other heavy bomber on either side.

The Liberator was plagued by several problems during its career. It was prone to fuel leaks. Its superchargers often failed. It was tail heavy. Bombardier and navigator were forced to operate from cramped quarters with limited visibility. It was physically tiring to fly and difficult to maneuver. It had fewer guns and less armor than the B-17 and was more vulnerable to enemy fighters.

All of these difficulties are reflected in the game. Your task is to go through the 19 missions doing more damage to Ploesti oil production than was done historically. To do this with your original crew and with all of the realism provided in advanced versions of the game will be a challenge.

We recommend that you work with the Mostar and Bucharest missions until you can take off, bomb the target, and land successfully. Once you are comfortable with this, we recommend that you turn to the Campaign Game.

1. Learning to Fly

The game is a dynamic model of the B-24. It is simplified in a way which points out the important aspects of this airplane while making it flyable by anyone who is not a pilot. Yet it is not simple to fly.

The aircraft will react to all changes in loading and its flight characteristics are quite real. When first learning the game, act like a test pilot and fly it around. Forget the rest of the game until you know the airplane.

Practice taking off and landing with different loads. Find out what the different stall speeds are with different loads and in different weather conditions. Try different flap settings, gear up, gear down, bomb bay doors open and closed. This is what every pilot does when he first gets a new aircraft. When you feel you know the aircraft, then go to war.

The following section will walk you through an Introductory Mission. We cannot recommend strongly enough that you complete this mission successfully at least once before moving on to the more challenging missions. Much of what is basic to the game is explained in the Introductory Mission.

Starting a Commodore Version Game

Turn on your system. Place the game disk into the disk drive. Enter LOAD"*",8 on your keyboard. When the message "READY" appears on your screen, enter RUN on your keyboard.

During loading, different screens will be put up including a copyright screen and a graphic representation of the B-24 bomber. One of these screens will ask you to select either the game or a game demo. To play the game, press **A**. To see the computer play a demonstration game against itself, press **B**.

NOTE: A joystick is required to play the game. The joystick must be connected to Control Port 2.

Spinazzola Army Air Base.

2. Introductory Mission

The menu is preset for the Introductory Missions. Press the space bar to advance to the next screen.

Mission Information

This screen provides your mission briefing.

"MOSTAR" is your target. "100% LEFT" indicates the target is undamaged and operating at full capacity.

"A/C READY 40" means that 40 aircraft are available for this mission. "A/C IN MAINT. 0" means that no aircraft are undergoing maintenance (which would make them unavailable for the mission). "A/C lost 0" means that no aircraft were lost on the previous mission.

"TARGET CLEAR" indicates the weather is clear.

"(G) TO GO, (0) TO STAND DOWN?" means you press the **G** key to take this mission. To stand down today (not fly a mission) you would press **Ø**. Enter **G** when you have finished reading the screen and the next screen will be displayed.

"MISSION 1" means this is your first mission. "GROUP EFFICIENCY = 100%" shows your current efficiency.

"TARGET LOCATION X325.18 Y186.50" gives the X, Y coordinates of your target. You should be at this location (or as close to it as possible) when you drop your bombs. Mostar is shown on your Data Card map at these coordinates.

"BOMBING ALTITUDE 10000" shows the mission has been assigned a bombing altitude of 10000 feet (± 99 feet). Bombing from other than the assigned altitude will deduct from your bombing accuracy.

"ASSEMBLY A/C X150 Y150 BLK" shows that your bombing group is to form up in the block (i.e. screen) where the X coordinates range from 150.00 to 159.99 and the Y coordinates range from 150.00 to 159.99 (this is the block the home airstrip is on). "≤160 MPH" indicates that your indicated airspeed (IAS) should be less than 160 miles per hour while you are forming up (but be sure to keep it above IAS 145 or you will fall out of formation).

"ASSEMBLY ALT. FROM 2000' TO 3000'" means your group is to assemble at an altitude between 2,000 feet and 3,000 feet.

"JOIN ROUTE OUT ESCORT AT X180 Y160 BLK" gives the rendezvous area for your outbound fighters. The block (screen) in this case is that for X coordinates 180.00 to 189.99 and Y coordinates 160.00 and 169.99. "25 MIN. ET." means that the fighters will arrive at the rendezvous area after 25 minutes of game time have elapsed (ET.

means elapsed time). The fighters will wait for you at the rendezvous point, but they have limited fuel. The longer you keep them waiting, the less time they will be able to provide you with cover.

"LEAD A/C IS HANGAR QUEEN" gives you the name of the B-24 you will be flying.

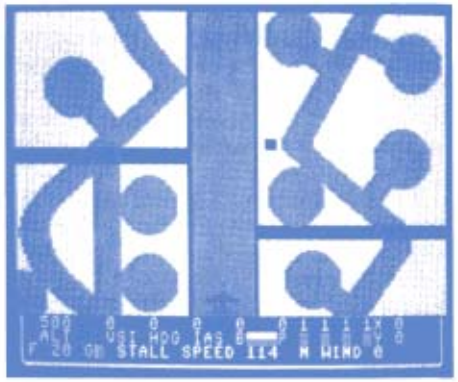
Hit the space bar. You will be asked how much fuel you want to take. Enter 1000.

You are now asked how many 500-pound bombs you want. Enter 12.

After you enter 12, the take off screen will appear. Press the space bar to stop the game (when you use the space bar to stop the game, you will be shown your assigned bombing altitude). You may use the space bar to stop the game at any time. If you should get into a situation where you don't know what to do, it is a good idea to press the space bar and stop the game until you can figure things out. You restart the game by again pressing the space bar. *NOTE: You can also use the* **N** *or* **E** *key to halt the game.*

Flight Information

Most of the information you need to play the game is provided in the display across the bottom of the screen. For a detailed explanation of each section of the display panel, refer to The Instrument Panel section of this rulebook.



For purposes of the Introductory Mission, the most important information in the display is:

ALT: Indicates altitude. At this time, your altitude is 500 feet above sea level.

VSI: Shows your rate of altitude gain or, if a negative number, loss. If XXX appears here, refer to the Recovering From a Spin section of this rulebook.

HDG: This stands for heading. A HDG of 0 means you are moving straight up, a HDG of 90 means your are moving straight right, a HDG of 180 means your are moving straight down, and a HDG of 270 means you are moving straight left.

B: This shows your degree of bank or turn. In the Introductory Mission, you may bank up to a maximum of 2. *NOTE: the more severe your bank, the easier it is to stall.*

Horizon Indicator: The narrow box between B and P. Watch the lines inside the box. When they are higher on the left, you are turning left. When they are higher on the right, you are turning right. When the line is thin along the bottom, your nose is pointed up. When the line goes nearly to the top of the box, your nose is pointed down.

P: This shows your degree of Pitch. At this time, your P is 0 which means your aircraft's nose is level. When P is positive, your nose is pointed up. When P is negative, your nose is pointed down. *NOTE: it is possible to lose altitude when P is a positive number >0.*

There are four engines. These are represented by the four "1"s above the four boxes. You will press + to increase engine power and – to decrease it. In the event of an oil leak or *windmill*, you may have to feather an engine. To do this, press the key that corresponds to the engine number to be shut down (1, 2, 3, or 4). Once an engine reaches 0 power for any reason, it cannot be re-started for the rest of the mission.

Windmilling occurs when a propeller increases drag on the B-24. The remedy for this is to "feather" the engine (move the propeller to streamline so this resistance is eliminated). Feathering must occur while there is still oil left from the engine. You may make only one attempt to feather an engine.

Messages: The section of the screen which displays your target altitude when the space bar is pressed. Normally, your

game speed is shown here. Game speed will range from "REAL TIME × 1" (the slowest speed, where the game is played in real time) to "REAL TIME ×60" (the fastest speed). "REAL TIME ×4" is the fastest speed while turning.

While playing the game, pressing **N** will call on the navigator to display the X and Y coordinates of the aircraft (if known) and the time that has elapsed since the beginning of the mission. It will also replace the visual display with a representation of the strategic game map. On this map, the location of your aircraft (if known) will be shown as a white plus symbol (+). *NOTE: This symbol may look like a diamond on some monitors.* The locations of airstrips and bomb targets will be shown as white rectangles. The locations of fighter rendezvous areas will be shown as black Xs.

Note: Mountain areas of Yugoslavia and Rumania are shown in black.

Pressing **E** will call on the engineer to display the amount of fuel remaining and the number of bombers in your bomber group. The game will pause while you are receiving this information and start again when you press the space bar. Other important information will be displayed here throughout the mission.

The Takeoff

Above the information display, your bomber is waiting on the runway. About halfway up the runway and to the right, the control tower is seen as a black rectangle. When you are taking off, if your IAS is not 110 or greater by the time you reach the control tower, abort the takeoff by pressing the **f2** key (shift/**f1**).

Hit the space bar to start the game again. Press the **F** key twice to drop your flaps to 20. Now press the + key eight times to increase your engine power to 9. Press the space bar to stop the game and look at the display.

Each of your engines should show 9. F should be 20. Now hit the space bar and your stall speed should be 114.

When your airspeed gets a little above stall speed (IAS > 114), pull the stick back so that P (Pitch) is 1. As soon as you climb, the screen will change to show your plane flying above the airstrip. Push the stick forward to level out again (P0), but be careful not to overcorrect or you may crash.

Raise your landing gear by pressing the **U** key. As soon as IAS reaches 140, raise your flaps by pressing the **R** key one time. Your F should now be 10. When IAS reaches 150, press **R** again to finish raising the flaps. F should now be 0.

Pull back on the stick until P = 5. Notice that your Horizon Indicator is now a thin line. Push the stick to the left until B = 2. Press the **A** key twice to accelerate the game to four times as fast as real time. Now press the space bar.

Several other changes have occurred in your information display since before the take off. Your HDG is changed from 0 (due to the turning caused by your bank). Your VSI (Vertical Speed Indicator) shows a positive number (P = 5 is causing you to climb fairly rapidly). Your IAS (Indicated Air Speed) is greater than 160.

Remember to watch your IAS. When you reach 2000 feet, you want it to be between 150 and 160 so your group can form up. While circling, you may have some difficulty in keeping your plane within the X150, Y150 Block (screen). If you fly off the screen to the right or the left, you may crash into hills which have an altitude of 2000.

You may fly off the top and bottom of the screen without crashing, but REMEMBER that your bomber group will only form in the proper block (X150–159.99, Y150–159.99), at the proper ALT (2000 to 3000), and at the proper speed (IAS less than 160).

Note: In order to conserve fuel and avoid enemy fighters, you will want to fly in a tight formation at an IAS between 155 and 160.

Press the space bar to continue the game. After you reach ALT 2000, reduce power by pressing the – key twice. Your engine power should be 7.

If your IAS should drop to 150 while you are climbing, increase power until it reaches 160 and then drop power back. You will receive messages telling

you when other bombers are joining up. Sometimes the "BOMBER ABORTED" message will appear in your message window. Each time this occurs, you will have one less bomber for this mission.

Keep climbing until ALT 2900 and then level off (P = 0). Cut power (by pressing the – key) to keep your IAS below 160 (but above 150). After leveling off, you will probably have to alternate between a power of 6 and 7 to keep in the proper IAS range.

When the "BOMBERS JOINED UP" message appears, the single B-24 on your screen will be replaced by three smaller planes in formation. Head for the fighter rendezvous in the X180, Y160 Block (screen). Come out of your bank (by moving the joystick to the right) when your HDG is 75 (approximately). Set your power at 8 and P at 5 (you may have to alternate between a power of 8 and 9 to maintain an IAS between 155 and 160).

Note: Except when in the same block (screen) as the target, you will fall out of formation if your IAS is 145 or less.

Press the **A** key twice. This will speed the game up by a factor of 4 (to real time times 16). Except in combat (enemy fighters or flak), you may double the game speed at anytime (until it reaches maximum) by pressing the **A** key. Pressing the **Z** key will automatically jump the game to maximum speed. You may return to slowest speed by pressing the button on the joystick. Banking, flak, and certain types of problems will also slow the game.

You may have to adjust your HDG as you near the X180, Y160 Block. Check with the navigator for your X, Y position to make sure you don't miss the rendezvous area. For maximum fighter coverage, arrive at the rendezvous area as close to ET 0:25:00 as possible. If you arrive early, circle until the fighters join up.

When the message "ESCORT JOINED" appears, you will see two smaller aircraft leading your formation. Maintain a HDG of 75. Continue to climb until you reach bombing altitude (10000) and then level off. You will probably have to keep Power between 6 and 7 to maintain IAS between 155 and 160. You may press **A** to speed up the game.

Keep checking with your navigator. When you are about two-thirds up the Y180 strip (Y coordinate is 186.50), set HDG to 90. *NOTE: When maneuvering, you may have to press the button on the joystick (to return to REAL TIME × 1) before you can get the exact heading you want. After getting the correct heading, you may speed the game up again.*

When you enter the X310, Y180 Block, you will be next to land and may run into enemy fighters. You are also adjacent to the target block.

Getting ready for mission take-off at dawn.

The Bomb Run

When about halfway through the block, press the button on the joystick to set the game to real time (its slowest setting) and prepare for your bombing run. Open the bomb bay doors by pressing **O**. This turns on your bombsight. You will see numbers next to the X and Y at the right of your instrument panel. *NOTE: When cloud cover is present, you will not get X Y coordinates from your bombsight or navigator. If unsure of what to do and not in a flak block, circle until the clouds go away.*

When lining up for this bombing run, the Y number is the most important. If it is a negative number, you are too far north and must bank right to correct. If it is a positive number, you are too far south and must bank left to correct. When Y is 0, your HDG should be 90.

When you open your bomb bay doors, your formation will be replaced on the screen by the bomb sight symbol. The added drag from the open doors will slow you down, so be ready to add power as needed. You want to bomb with an IAS as close to 155 as possible.

When you reach the X320, Y180 Block, you will start to take flak. *NOTE: You do not want to enter the target block if you are out of formation. If you can't rejoin the formation for the target run, press* **f2** (shift/**f1**) to abort, turn around, and go home.

Just before both X and Y are 0 (or very close to it), you are over the target. Immediately press **S** to drop your bombs. The message "BOMBS AWAY" will appear. *Note: In case your instruments should fail, your target is the railroad yard. In case of instrument failure, refer to the Data Card for a picture of the target and drop your bombs when you are over target.*

Immediately following the bombing, press **C** to close the bomb bay doors and reduce drag. Do a left bank of 2 until your HDG is 0. *NOTE: Be careful not to exceed IAS 165 or you will lose planes from your formation. When you leave the target block, you enter a mountain block. Stay above ALT 8000 or you will crash.*

You should now be in the X320, Y190 Block. Set a course back to the airstrip. Be sure you do not cross the target block again or you will again receive enemy flak.

NOTE: It is possible that your aircraft will be damaged by enemy fighters or flak. If it is too heavily damaged, it will not be able to make it back to the airport at Spinazolla. There are closer airports, at Vis and Foggia, at which an emergency landing may be made. If you think you can't make it back, refer to the ALTERNATE LANDING STRIPS section of these rules. The most common reasons for making these landings are fuel leaks or the loss of more than one engine (you can also bail out if you are over land and more than 500 feet above it by pressing **f8** *(shift/***f7***).)*

You want to reach the coast of Italy at the X190, Y130 block. A HDG of 245 is about right. You may need to make adjustments as you approach the coast. Once over water, begin descending (P = –1) to get down to an ALT of 2200. When you reach the Y130 strip, take a HDG of 270. *NOTE: You may again hit* **A** *to speed the game, but be careful. Don't let your ALT drop below 2000.*

The Landing

When you reach the middle of the X150, Y130 Block, your HDG should be 0. This will require some maneuvering. Drop the landing gear (press the **D** key), set the game to its slowest speed, and descend to ALT 600. When you are within 15 miles of the landing strip, you may use the X Y indicators on the right of your display panel to guide yourself in. (For landing, the X number is the most important. When it is 0 your HDG should be 0.)

NOTE: It may be that your instruments were damaged by flak or fighters. In this case, use your game map to navigate. Each screen corresponds to a 10 mile by 10 mile square on the map. Count squares and look for landmarks. When you get to two squares below the landing strip, line up with a HDG of 0 about one B-24 wingspan west of the north-south road.

As you level out, your speed will decrease. When you see the runway, your flaps should be lowered to about 40 and your IAS should be between 115 and 122. Descend to just a few feet (ALT 510 – 520) above the runway and level out.

As you approach the runway, the X on your display should show 0 (or a number very close to 0). When the Y number approaches 1, the screen will show a close up view of the runway. You have a short period of time to do your final maneuvering. You should be only a few feet above the runway at this point and ready to pitch down. It is safest to land with your engines at the lowest power setting that will avoid stalling with 40 degrees of flaps.

Remember that the ALT of the airstrip is 500. You have to lower yourself to just above this height and level off. Just after you cross the edge of the runway, pitch the nose down and let the plane land. As soon as you are down, cut the power to 1 by repeatedly pressing the – key.

NOTE: if you land with a VSI of less than –499 (–500 or less) you will crash.

After your landing, a score screen will appear which will tell you how many airmen and B-24s you lost on the mission, how much of the target remained undamaged, and what score you received.

You will then return to the SELECT GAME MENU.

Now that you have flown at least one INTRODUCTORY MISSION, the following sections will introduce you to the complete gaming rules, goals, and successful flying tips.

3. Goal

Your role in this game is the commander of the 460th Bomb Group(h) stationed at Spinazolla Air Base in Italy. The game begins in March, 1944. This group flew 217 missions until inactivated in September, 1945. There were 19 missions to the Ploesti area in total. If you crash or get captured on any mission, then you will be the next commander in line (of 60 aircraft the group started with, only 4 remained after the first 50 missions).

Your job is to reduce the total production of the Ploesti oil fields to as close to 0 as possible. After the 19 missions are completed, you may compare your performance with what was done historically (between 8500 and 9500 tons/day). If the production rate is greater than it was historically, you will be given an estimate of how much you would have prolonged the war. If you exceed the historical bombing performance, you will be given an estimate of by how much you would have shortened the war.

The Mostar mission should be viewed as an opportunity to train for the campaign. The Bucharest mission provides an opportunity to operate against a tough target without impacting your campaign game. These missions are flown against railroad marshalling yards.

4. Game Menu

At the start of each game, the SELECT GAME MENU will be displayed. The menu is preset for the Introductory Mission. This menu lets you select three different games and different levels of difficulty for a variety of factors: level E is easiest, level H is historic, and level H+ is hardest (showing how tough things could have been).

Note: When recalling a campaign game, you must reset A through I before you begin play.

Use the **A** key to select the types of games: Mostar, a single mission to the easiest target; Campaign, 19 missions to the petroleum plants in and around Ploesti; and Bucharest, a single mission to a difficult target.

Use the **B** key to select the level of engine performance. On level E, engines will neither overheat nor fail for mechanical reasons. On level H, engines can overheat and have a chance of failing for mechanical reasons. On level H+, engines can overheat and have a greater chance of failure.

Use the **C** key to select the reliability of your fighter escorts. At level E, the fighters are always at the rendezvous square on time. At level H, there is a chance they will be late. At level H+, there is a greater chance they will be late.

Use the **D** key to select the probability your group will be intercepted by enemy fighters. Level E sets this probability at half of the historical level. Level H sets this probability at the historical level. Level H+ sets this probability at greater than the historical level.

Use the **E** key to set flak accuracy. Level E provides for inaccurate flak. Level H provides for normal flak accuracy. Level H+ provides for very accurate flak.

Use the **F** key to set landing run out (braking ability of aircraft). Level E sets this at short. Level H sets this at normal. Level H+ sets this at long. The longer the run out, the greater the chance you will run off the end of the runway and crash when attempting to land.

Use the **G** key to set the difficulty for rejoining the mission group once you have lost it. Level E provides for a quick rejoin once target altitude is reached. Level H provides for a normal rejoin at the target altitude. Level H+ requires

Mission of July 28, 1944 over Ploesti.

twice the normal distance to catch up and rejoin. You will drop out of formation when your IAS drops to or below 145. (To rejoin, you must be at target altitude and flying at greater than formation speed. The more your IAS exceeds formation speed, the sooner you will rejoin.) If you lose the formation prior to bombing, it is best to abort the mission (press **f2** (shift/**f1**)) and go home.

Use the **H** key to set bombing accuracy. Level E provides increased bombing accuracy. Level H provides normal bombing accuracy. Level H+ makes accurate bombing difficult.

Wind effects are either there (**Y**) or not (**N**). When no wind is selected, the weather is always clear and there is no wind. When wind is selected, normal weather conditions are in effect. High wind will cause the airplane to drift, but also permits a takeoff with a heavier bomb load. Overcast (undercast from the bomber's viewpoint) skies make bombing and navigation difficult, but provide cover from enemy fighters and flak.

Press the space bar to advance to the next screen. You will be asked if this is your first mission. If you want to continue an existing game, answer **N**. To start a new game, answer **Y** and, if you chose the campaign game, you will be given an opportunity to format a new save game disk. If you do not have a separate save game disk, you must make one. After your save game disk is inserted, press the space bar to continue with the game.

5. Campaign Selection Screen

When playing the game, you are given a choice of 12 targets. The campaign game will run until you complete 19 missions. The current game day number is displayed at the top right of this screen.

Information for each target is displayed on that target's line. This information includes: the target number (1–12), the target name, and the current tons per day of production by the target.

The total production of all the targets is shown on the line below target 12. Your goal in the game is to get this total production number as low as possible by the end of the campaign.

The campaign begins with 40 aircraft ready to go and 0 in maintenance (MAINT.). As your aircraft are lost or damaged on missions, the number of ready aircraft will fall and the number of aircraft in maintenance will grow. You may need to pass missions by to permit aircraft to be repaired and replacement aircraft to arrive. The more aircraft that drop bombs on target, the

more enemy production numbers will drop.

Weather status is shown for HOME, ROUTE, and TARGET. Each of these represents about one-third of the total play area. When N is selected for WIND, weather is always clear. When Y is selected for WIND, weather is clear, broken, or overcast.

Wind direction and velocity are given. The higher the wind velocity, the more load you will be able to get airborne. High winds also make it more difficult to hold a steady course. *Note: Wind speeds will at times be higher than is realistic. This is because temperature has been factored into wind effects for simplification.*

To select a target, press the number key(s) for that target and then press **RETURN**. To stand down (not fly a mission this game day), press the **Ø** key and then press **RETURN**.

Refer to the data card for illustrations of the targets.

6. Mission Information Screen

This is the screen that provides you with the "briefing" for the mission you have chosen. You may want to write down some of the information presented here so that you can refer to it later in the mission.

"MISSION N" means this is your Nth mission. "GROUP EFFICIENCY = N" shows your current efficiency. The number shown here will change after you fly missions. Successful missions increase efficiency; unsuccessful missions decrease it.

"TARGET LOCATION X Y" gives the X, Y coordinates of your target. You should be as close as possible to this location when you drop your bombs. The target is shown on your map at these coordinates.

"BOMBING ALTITUDE – N" shows the mission has been assigned a bombing altitude of N feet. Bombing from other than the assigned altitude (± 99') will deduct from your bombing accuracy.

"ASSEMBLE A/C X150 Y150 BLK" shows that your bombing group is to form up in the block (i.e. screen) where the X coordinates range from 150.00 to 159.99 and the Y coordinates range from 150.00 to 159.99. "@<160 MPH" indicates that your indicated airspeed (IAS) should be less than 160 miles per hour while you are forming up (but be sure to keep it above IAS 145).

"ASSEMBLY ALT. FROM 2000' TO 3000'" means your group is to assemble at an altitude between 2,000 feet and 3,000 feet.

"JOIN ROUTE OUT ESCORT AT X180 Y160 BLK" gives the rendezvous area for your outbound fighters. The block (screen) in this case is that for X coordinates 180.00 to 189.99 and Y coordinates 160.00 and 169.99. "25 MIN. ET." means that the fighters are scheduled to arrive at the rendezvous area after 25 minutes of game time have elapsed (ET. means elapsed time). The fighters will wait for you at the rendezvous point, but they have limited fuel. The longer you keep them waiting, the less time they will be able to provide you with cover.

"JOIN TARGET ESCORT AT X650 Y180 BLK" gives the rendezvous block (screen) for your target fighters. "3:10 ET." means the fighters are due to arrive at the rendezvous area after 3 hours and 10 minutes of game time have elapsed. *NOTE: There are no TARGET fighters for the Mostar mission.*

"JOIN ROUTE BACK ESCORT AT X650 Y140 BLK" gives the rendezvous block (screen) for your inbound fighters. "4:05 ET." means the fighters are due to arrive at the rendezvous area after 4 hours and 5 minutes of game time have elapsed. *Note: There are no ROUTE BACK fighters for the Mostar mission.*

"LEAD A/C IS N" gives you the name of the B-24 you will be flying. This name will change following each mission in which your lead aircraft crashes.

Hit the space bar. You will be asked how much fuel you want to take. For the Ploesti mission, 2400 gallons is probably a minimum. For Bucharest, 2600 is probably a minimum. Mostar can be done with 1000 gallons. How much fuel is needed depends on the distance to your target, your bombing altitude, the number of bombs you take, weather conditions, and your flying skill. *NOTE: You can take off with a heavier load when there is a strong wind.*

You are now asked how many 500-pound bombs you want. The more bombs you take, the more difficult it will be to take off and the more fuel you will burn in reaching the target.

★ ★ ★ ★ ★

Choosing the correct amount of fuel and number of bombs for a mission is an important and difficult decision. The following information is intended to help you choose the proper load. All of the following information assumes there is no wind.

The higher the power setting at which you fly, the more fuel you burn. You will burn the following number of gallons per hour of flight:

P9 388.8	P8 345.6	P7 302.4
P6 259.2	P5 216	P4 172.8
P3 129.6	P2 86.4	P1 43.2

One gallon of fuel weighs about 6 pounds. A full load of fuel (2814 gallons) weighs 16,884 pounds. A full load of bombs (12 at 500 pounds each) weighs 6,000 pounds. A full load of fuel and bombs will weigh 22,884 pounds.

With a maximum load, your stall speed on take off is IAS 140 with 0 flaps, IAS 135 with 10 flaps, and IAS 125 with 20 flaps or greater. With no load, your stall speed with 20 flaps is IAS 95.

With each gallon of fuel you burn, you reduce your load by 6 pounds. With each bomb you drop, you reduce your load by 500 pounds. Your load weight is therefore constantly changing. For every 84 gallons of fuel you have remaining when you land, you could have taken one more bomb on the mission (in exchange for 84 less gallons of fuel).

With a full load of bombs and fuel, your maximum continuous rate of climb is: at sea level, 594 feet per minute; at ALT 5000, 494 feet per minute; and at 10000 feet, 400 feet per minute. At sea level with 1000 gallons of fuel and no bombs, your maximum continuous climb rate is 855 feet per minute.

To reach bombing altitudes with a full load it takes a minimum of: 28 minutes to reach 10000 feet, 59 minutes to reach 15,000 feet, 1 hour and 50 minutes to reach 20,000 feet, and 2 hours and 40 minutes to reach 24,000 feet.

All of the above assumes an average IAS of 155.

At sea level with no bombs and 1000 gallons of fuel, your maximum cruising speed is IAS 201. With a full load, your maximum cruising speed at sea level is IAS 188. With a full load at 20,000 feet, your maximum cruising IAS is 163.

Flying with a full load and an IAS of 157.5: at sea level, you burn 302.4 gallons of fuel per hour and require a power setting of 7; at 10,000 feet, you burn 336.96 gallons of fuel per hour with a power setting of 7.8; and at 20,000 feet, you burn 367.2 gallons of fuel per hour at a power setting of 8.5.

Flying with 1000 gallons of fuel, 12 bombs, and an IAS of 157.5: at sea level, you burn 250.56 gallons of fuel per hour with a power setting of 5.8; at 10000 feet, you burn 293.76 gallons of fuel per hour at a power setting of 6.8; and at 20,000 feet, you burn 336.96 gallons of fuel per hour with a power setting of 7.8.

★ ★ ★ ★ ★

After you enter the bomb number, the take off screen will appear. Refer to the introductory game for information on takeoffs, bomb runs, and landings. If you have chosen weather, you may have to compensate for drift.

7. Mostar and Bucharest

The Mostar and Bucharest missions are not part of the campaign game. They are provided to give you an opportunity to sharpen your gaming skills before going into the campaign game. Refer to the Data Card for illustrations of Mostar and Bucharest.

Because these are independent missions, they are handled slightly differ-

ently from the campaign game. When one of these missions is selected, a screen is shown which shows the weather at HOME, ROUTE, and TARGET (TARGET only for Mostar).

There are always a full complement of 40 aircraft for these missions. The only choice the gamer has to make is whether to fly the mission (**G**) or stand down (**0**).

The MISSION INFORMATION SCREEN is the same as that for the Campaign Game except that there are no TARGET or ROUTE BACK fighter rendezvous for the Mostar mission. The ROUTE OUT fighters are able to provide protection during the entire Mostar mission.

8. Scoring

There are six levels of score (0 – 5) reflecting 6 different levels of difficulty. The higher the level, the more difficult the game. The introductory mission is Level 0. The historical campaign missions are Level 3.

Points are awarded for: taking off and landing successfully; the number of bombs taken on a mission; the number of aircraft that bomb the target; and the damage done to the target. Points are subtracted for airmen and aircraft lost.

The base score is adjusted by the level of difficulty. The higher the level of difficulty, the higher the base score is adjusted. The adjusted score is multiplied by your efficiency rating to arrive at your final score.

On a historical mission (Level 3) with an efficiency of around 100, a good score is around 600.

9. Mission Efficiency

Unlike the Mostar and Bucharest missions, performance on a single mission in the Campaign Game can have a lasting effect. This effect is the result of your group's Efficiency Rating.

When you bomb a target, how much damage you do to that target is determined by a number of factors. These are the altitude at which you bomb, your IAS when you bomb, how close you are to the correct drop point when you bomb, and how many bombs are dropped on the target (this last is dependent on both how many bombs you take on a mission and how many planes reach the target). All of this is used to determine a preliminary bombing number.

The preliminary bombing number is then multiplied by your Efficiency Rating for the final determination of how much damage was actually done to the target. For example: If your preliminary bombing number showed 80% of the target destroyed and your Efficiency Rating is 120%, the actual amount of the target destroyed on that mission would be 80 percent times 120 percent (.80 × 1.20) or 96 percent. If your Efficiency Rating were 90%, the actual amount of destruction would be 80 percent times 90 percent (.80 x .90) or 72 percent.

Your Efficiency Rating reflects the skill and experience of your group. For every plane which drops bombs on target, your efficiency rating increases by .25 percent (an additional 4 percent is awarded if you totally destroy the target). For every new replacement plane that joins your group, your efficiency drops by 1 percent. When the lead Liberator is lost (your plane), efficiency drops by 9 percent (2 percent if the crew survives).

Your Efficiency Rating will not drop below 50 percent. As long as it is below 100 percent, it will increase by one percent per day for every day you stand down.

10. Damage and Mechanical Failure

While on a mission, your aircraft may be damaged by flak, enemy fighters, mechanical failure, or engine overheating. The following types of problems may develop:

OIL LEAK: The indicated engine will begin to lose power. The engine must be feathered before all oil is lost or it cannot be feathered at all. When engine power reaches 0, it will begin to windmill and it cannot be feathered.

SUPERCHARGER: When a supercharger is lost to either enemy action or mechanical failure, that engine's power will be reduced by 3.

ENGINE LOSS: Engines can be lost for a variety of reasons including mechanical failure. If an engine quits because of a mechanical failure, it can be feathered. If it quits because of an oil loss, it cannot be feathered.

FUEL LEAK: Fuel is being lost at a constant rate. The more fuel leak messages you receive, the greater the rate of loss. If fuel leaks occur while far from a landing strip, it is unlikely you will be able to make it back with your aircraft. You will continue to lose fuel until you land or crash.

Crash landing!

NOSE AND RDF (RADIO DIRECTION FINDER) HITS: These cause a loss of navigational instruments making the bombsight, navigator, and landing guide less useful or useless.

COCKPIT HITS: These cause the IAS and VIS indicators to fail.

FLAP HIT: Damaged flaps cannot be used. This makes landing much more difficult.

AUX HYDRAULIC OUT: This won't matter unless #3 engine is also lost. In this case, neither the landing gear nor the flaps can be lowered. The best thing to do in this case is to bail out over Italy. You have about a 50/50 chance of crash landing the plane, but even then the plane is wrecked.

NOTE: When certain problems occur, the game is set to automatically go to real time (× 1) and make a warning sound until the problem is corrected. In instances where the problem can't be corrected (flying just a little faster than stall speed as an example) you may want to toggle this feature off to end these messages and permit you to speed the game beyond real time. This feature may be toggled off and on by pressing the **9** *key.*

11. Alternate Landing Strips

Vis Landing

The Vis airstrip is located in the X300, Y200 Block. It is a short airstrip intended for use by fighters. At the end of the airstrip is a 500-foot drop into the Adriatic Sea. When landing at Vis, have flaps set at 40 and use the slowest possible IAS. Pitch down the instant you cross the end of the runway and power down immediately.

The altitude of the airstrip is 500. Approach it from the south (X300, Y190 Block). Set HDG to 0 when X is about 305. You may drop your landing gear (**D**) when you are about one-third of the way up the screen in the X300, Y190 Block. Your altitude should be between 500 and 600 when you enter the X300, Y200 Block. You may have to spiral down to reach this altitude.

Use the X Y indicators at the right of the display to guide yourself in for the landing. X should be close to 0 as you approach. When Y approaches 1, you will see a close-up screen of the runway. When this occurs, do the final maneuvering for the landing. Your ALT should be between 520 and 500 at this point. *NOTE: the Vis screen (block) is unusual in that it has two separate altitudes. The island is at ALT 500 and the ocean is at ALT 0. It will probably be suicidal to find out exactly where the altitude line is drawn. Be sure you are above ALT 500 when landing at Vis.*

When playing a campaign game, there will be a one-day delay in returning your aircraft to the home air base following a Vis landing.

Foggia Landing

The Foggia airstrip is located in the X180, Y180 Block. A low-level approach is possible for this strip. If you are returning from a mission and find yourself unable to climb over the 2000 ALT hills which surround Spinazolla, you can still land at Foggia if you can get your ALT to a little above 500.

In making the low-level approach, fly west along the Y170 strip. When you reach the X180, Y170 block, assume a 0 degree heading at about X185.5 and lower your landing gear. Use the X Y numbers at the right of your display to guide yourself in as you would for any other landing.

The Foggia airstrip has an ALT of 500.

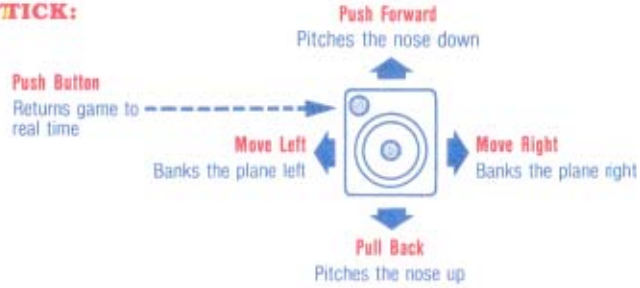
In the event your navigational instruments aren't working, you can line up about one B-24 wingspan west of the north-south road and use it for a guide in approaching the airstrip.

When playing a campaign game, there will be a one-day delay in returning a plane to service which has landed at Foggia.

12. Controls

The following controls are used in B-24:

JOYSTICK:



Commodore 64 KEYBOARD:

(+) Increases engine power up to a maximum of 9

(−) Decreases engine power down to a minimum of 1

(F) Lowers flaps down to a minimum of 40

(R) Raises flaps up to a maximum of 0

(1) Feathers engine #1

(2) Feathers engine #2

(3) Feathers engine #3

(4) Feathers engine #4 (Feathering will streamline to reduce drag. Engines that are losing oil or have lost power should be feathered. Once an engine has lost oil, it cannot be feathered.)

(D) Lowers landing gear

(U) Raises landing gear

(A) Accelerates time by increments of 2 to speed up the game. Maximum increase is times 60.

(Q) Toggle warning messages off and on. Can be used to eliminate the auto-reduction to slowest time when a warning is given.

(f2) Will abort a take off or mission. When a mission is aborted, the rest of the group will bomb without you. Such bombing is inaccurate and some planes are lost to combat.

(O) Opens bomb bay doors to permit bombing and turns on bombsight

(S) Drops bombs

(C) Closes bomb bay doors

(f8) Bail out (if over land and at least 500 feet above it)

(SPACE) Pauses game when hit. Restarts game when hit again.

(N) Calls for coordinate and time information from navigator and shows game map

(E) Calls for fuel and formation information from engineer

(Z) Accelerates game to fastest speed (X 60) immediately

13. Aerial Combat

Enemy fighters will be a constant threat to you when you are over or near Yugoslavia and Rumania. You have several methods of dealing with enemy fighters. The first of these is to fly in a tight formation. A tight formation permits the maximum use of the bomber formation's machine guns. Historically, enemy fighters would steer away from planes flying in tight formations in favor of pouncing on those flying in a sloppy formation.

In game terms, flying in tight formation is represented by maintaining an IAS between 155 and 160. Occasionally you will see the message "BOGEYS PASS" appear on your screen. This means that an enemy fighter group has flown by, looked you over, and decided to find easier prey.

The second protection against enemy fighters is provided by friendly fighter cover. The B-24s could fly much further than the fighters which protected them. When flying on the longer missions, you will have to rendezvous with three separate fighter groups. It will require very efficient flying on your part to avoid causing gaps in your fighter cover. Fighters can stay in the air for a limited amount of time. If you are late to a rendezvous or perform unnecessary maneuvers which waste fuel, you will be cutting down on your fighter protection.

Aerial combat itself burns fuel and the more enemy groups your fighters combat, the shorter the time they will stay with you.

The third protection against enemy fighters is to fly at less than ALT 5000. This option is generally not available on the trip to target, but it can be used on the way home. This option is particularly attractive to the formation which has lost fighter protection or the plane which has lost touch with the formation.

It is possible to flyback at an altitude of just over 2000 feet. When returning from Campina, Ploesti, or Bucharest, this does require flying over one flak city. Low flying has the added advantage of saving fuel. Study the map for low altitude routes home.

Even if you do everything right, you can still be attacked by enemy fighters that fight past your fighter protection or refuse to be frightened off by your tight formation. When fighters attack, you will hear the sound of machine gun fire. Enemy fighters move to the left to attack your group. Friendly fighters move to the right to defend your group.

When enemy fighters are adjacent to your bombers and you hear a machine gun sound, at least one plane in your formation has taken some damage. Unless your plane is damaged, you will only know of this damage by seeing a smaller number of planes in your formation or by seeing more aircraft in maintenance after a mission.

14. Using the Map

A map of the bombing missions operations area has been provided with the game. An understanding of the map is necessary for success in the game. The map is an aid in plotting the most efficient course to target, low flight home (primarily for damaged aircraft), and navigation in the event of heavy overcast or instrument failure.

The map is divided into 10-mile squares. Each of these squares corresponds to a strategic screen. These screens, or blocks, are referenced in the mission briefing. Each block is referred to by its lowest numbered X and Y coordinates. **EXAMPLE:** The X160, Y180 block refers to the map square/game screen where the X coordinates run from 160.00 to 169.99 and the Y coordinates run from 180.00 to 189.99.

On the map, X coordinates run from west to east and are numbered from 100 to 799.99. The Y coordinates run from south to north and are numbered from 110 to 209.99. To find Target 1, for example, find where the X coordinate 724.92 intersects with the Y coordinate 162.94. Refer to the Strategic Map on your Data Card for examples.

A close-up map of the bomb targets is located on the reverse of the map card. These closeups show the relation

of thesse targets to the other terrain in their sscreen. In the event of a bomb-sight fäailure, you may have to drop your bombss based on visual sightings. Your targetss are either railroad marshalling yards cor buildings. Refer to the illus-trationns of your target on your Data Card.

Thee map also identifies different terrainn types, each with its own altitude. When ccrossing terrain, if the altitude of your B3-24 is not greater than the ter-rain alltitude, you will crash. To bail out, you must be a minimum of 500 feet above tthe terrain in the square.

Terrrain altitudes (expressed as feet above ssea level) are as follows:

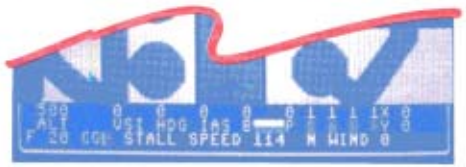
Normaal land – 500. All of your airfields are loccated at altitude 500.
Water · – 0.
Hills — 2000.
Mounttains – 8000.
Cities · – the same altitude as the sur-roundiing terrain. Note that cities are identiffied as having either no flak, light flak, oor heavy flak. Ploesti, Campina, and Bucharest are the only heavy flak cities iin the game. (See Data Card for this iddentification).

Wheen on a mission, you should avoid enteriing the square of any city with flak unless the bombing target is also in thait square. All cities east of the Adriatiic are enemy controlled.

Youu may call up a smaller version of the maap on your game screen by press-ing thee **N** key while playing the game.

15. The Instrument Panel

The instrument panel is shown as a displayy below the map screen. Informa-tion prrovided by this screen is impor-tant too the successful completion of a bombiing mission. Except in cases of instrument failure, this information is continuually updated during play.



The information provided by this display is as follows:

ALT: This indicates altitude (in feet above sea level). In the event of a loss of your Vertical Speed Indicator, you may calculate vertical speed by switching to real time and comparing your change in altitude on a minute-by-minute basis.

VSI: means vertical speed indicator (the amount of altitude lost or gained per minute). When the VSI is a negative number, you are losing altitude. The smaller the negative number (keeping in mind that –100 is smaller than –50), the more rapid the loss. A positive num-ber (other than 0) shows you are gain-ing altitude. The larger the number, the more rapid the gain. The further VSI is from 0, the greater your rate of altitude change.

HDG: This stands for heading. You may think of heading as a giant clock dial on the screen which is marked off in degrees (from 0 to 359) instead of min-utes and hours. Your B-24 is the clock hand and whichever degree it is pointed to is the number that appears beside HDG. A HDG of 0 means you are point-ing straight up. A HDG of 90 means you are pointed straight to the right, a HDG of 180 means that you are pointed straight down, and a HDG of 270 means that you are pointed straight to the left. You will get more accurate information on your direction (course heading) from the HDG number than from the facing of the B-24s on the screen. *NOTE: The effects of wind can move your aircraft in a different direction than the one indicated by HDG. The stronger the wind, the greater the effect on your course.*

IAS: This shows your indicated air speed. When flying, it is necessary to keep your indicated air speed higher than your stall speed. It is important to remember that air speed is different from ground speed. Air speed measures the speed at which you are passing through the air. When diving, climbing, or in times of high winds, there may be significant differences between the speed at which you are moving through the air and the speed at which you are moving over the ground. You can fall out of formation if you fly with an IAS of 145 or less. After dropping our bombs, you can lose planes from your forma-tion if you fly with an IAS of 165 or more.

B: This shows your degree of bank or turn. Except in the Introductory Mis-sion, you may bank up to a maximum of 6. A B of 1 is a 10-degree bank. A B of 6 is a 60-degree bank. *NOTE: The more severe your bank, the easier it is to stall.* When you are banking, "steps" (the Horizon Indicator) will appear in the space between B and P. When you are turning to the right, these steps will climb to the right. When you are turn-ing to the left, the steps will climb to the left.

P: This shows your degree of Pitch. When P is 0, your aircraft's nose is level. When P is a positive number (other than 0) your nose is up. The larger the number, the higher the nose is pointed. A negative P means your nose is pointed down. When you are flying level, a bar (the Horizon Indicator) goes midway up the space to the left of P. When your nose is pointed down, the bar will go to the top of this space. When your nose is pointed up, the bar will be a thin line along the bottom. A P of 1 is a 5-degree pitch. A P of 9 is a 45-degree pitch. *NOTE: Under certain conditions, it is possible to lose altitude when your nose is pointed up (P is a positive number >0).*

1–4: There are four engines. These are represented by the four numbers above the four boxes. The numbers show how much power is supplied to each engine (0 through 9). In the event of an oil leak or windmill, you may have to feather an engine. To do this, press the key that corresponds to the engine number to be shut down (The engines are num-bered 1 through 4 with 1 on the left and 4 on the right) and press **Y** when asked if you want to feather the engine (You get only one chance to feather an engine each mission).

The boxes below the engine num-bers show engine temperature. When the engine is hot, an H will appear in the box and the box will be red on color monitors. When engine temperature is normal, no letter will appear in the box and the box will be green on color monitors. Running engines for an ex-tended period of time in the hot range will cause them to burn out. Engines will normally start to burn out when run at power level 9 for more than 20 minutes (game time). To cool engines, run them at power 8 or less.

When an engine has been feathered, the engine box will be bisected by a hor-izontal line. When an engine is wind-milling, the engine box will be bisected by both a horizontal line and a vertical line.


FEATHERED WINDMILLING

Windmilling occurs when a propel-ler is not streamlined to the air flow and increases drag on the B-24. The remedy to this is to "feather" the engine (move the propeller to streamline so this resistance is eliminated). Feather-ing must occur while there is still oil pressure left from the engine.

X Y: Information is provided here for bombings and landings. When the bomb bay doors are open and you are within 10 miles of your assigned target, num-bers will appear here. Maneuver your B-24 so that both the X and Y numbers are 0 (or as close to 0 as possible). Just

before this point, it is time to drop your bombs. *NOTE: While the bombsight is on, the bombardier is actually steering the B-24.* When your landing gear is down and you are within 15 miles of your airstrip, numbers will again appear here. Pilot your B-24 to bring X to 0 and then set a course that brings Y continually closer to 1 until a zoom-in of the runway appears and you can land.

F: These are your flaps. When your flaps are lowered, your lift is increased and your stall speed and air speed decreased. Flaps are lowered for take offs and landings and raised for flight. *NOTE: Flaps increase drag.*

G: This is your landing gear. When the landing gear is down, the box next to G is filled (green on color monitors). When the landing gear is up, the box next to G is half filled (the filled half is red on color monitors).

Messages: The bottom of the display is devoted to your message display. When the space bar is pressed, the game will stop and this section of the screen will show your assigned bombing altitude. Normally, your game speed is shown here. Game speed will range from "REAL TIME × 1" (the slowest speed, where the game is played in real time) to "REAL TIME × 60" (the fastest speed). The fastest speed while banking is "REAL TIME ×4."

While playing the game, pressing **N** will call on the navigator to display the X and Y coordinates of the aircraft (if known) and the time that has elapsed since the beginning of the mission. A miniature version of the strategic map will appear on the screen. On this map, the location of your aircraft (if known) will appear as a white plus symbol (or diamond). The locations of landing strips and bomb targets will be shown as white rectangles. The location of fighter rendezvous areas will be shown as black Xs. Pressing **E** will call on the engineer to display the amount of fuel remaining and the number of bombers formed up.

The game will pause while you are receiving this information and start again when you press the space bar. Other important information will be displayed here throughout the mission. Remember these messages.

16. Miscellaneous

Clouds

Clouds drift across the screen and can totally obscure your view of the ground at any time. When this occurs, your navigational instruments will be unable to provide you with X Y information. Total cloud cover can occur even in areas designated as having clear weather.

Clouds can be dealt with by waiting for them to go away, by counting blocks and using the map to determine location, or by reckoning the location of targets or airstrips based on experience or referencing the Data Card.

Landing

All landings in the game have to be made at the southern ends of the airstrips. You should approach all airstrips from the south.

Bailing Out

You may bail out anytime you are over land and at least 500 feet above the land altitude. If you bail out over friendly territory, you will save your crew. If you bail out over enemy territory, your crew may be lost or captured.

There is a chance that your crew will be rescued by friendly partisans and eventually returned to you. The closer you are to Italy when you bail out, the greater the chance your crew will be rescued.

Recovering From a Spin

For a variety of reasons, you may find yourself in a spin. When VSI reads XXX, you are losing altitude at more than 1000 feet a minute. To recover from this, first level out your airplane (set B and P to 0 and make sure the Horizon Indicator shows you are flying level). After you have leveled out, power up and dive. When your IAS begins to go up instead of down, set pitch to 0 and wait for a 0 VSI indication.

Aborting a Mission

Missions may be aborted before or after takeoff by pressing the **f2** key (shift/**f1**). If a mission is aborted, it does count as one of your campaign missions.

When a campaign mission is aborted, your plane will drop its bombs. You should then return to the air base. Your group will complete the mission without you. The bombing accuracy of your group in this situation will be limited and planes will be lost and damaged.

Missions may only be aborted prior to bombing.

Typically, missions should be aborted if you are unable to keep up with your formation.

Forming the Bomber Group

As a concession to playability, we have condensed the time required to form up the bomber group. Historically, this process would take a minimum of 20 minutes of real time and could take more than an hour.

Messages

When you fly at less than 5 mph above stall speed, you will get a stall warning. When you fly below IAS 150, you will be warned you are about to fall out of formation.

Bombing

Because there is a slight delay between the time the S key is pressed and when bombs actually drop, it is necessary to press the key a little early for the best bombing results.

17. Designer's Notes

My main motivation in designing this game is to give a three-dimensional experience to a player that reading a book on the subject cannot possibly emulate. Both Ted Newby and I would like to dedicate this simulation to the many thousands of bomber crews that experienced this first hand, both survivors and those who did not survive.

Both Ted and I feel qualified to convey this experience to those of you who would like to know what it was like. Ted was a B-24 bombardier in the 460th Bomb Group. He was shot down on his 50th mission and is the author of *Target Ploesti: View From A Bombsight.* I was a flight engineer on a B-29 with 12 missions over Korea and have been a pilot for over 40 years.

This flight simulator is a different approach than has been done in other computer flight simulators. It is impossible to get the real feel and seat-of-the-pants feedback from a computer. This simulator is designed to not be a hand-eye coordination type of game. The thrust of the design has been to emphasize the real problems that a bomber pilot must concentrate on and minimize the importance of things that a computer cannot do well (and that do not add to the point of the simulation). This does make some aspects of the flight simulator appear unrealistic, but in fact, the simulator is very realistic.

We have assumed that you as Pilot and Group Commander have long since mastered the coordination of basic flight — including the manipulations of the stick and rudder. So we have abstracted this aspect of flying, and concentrated on more important aspects of flight.

The B-24 in this simulator is very real. It is a dynamic model of the flight characteristics of this aircraft. The air speed is Indicated Air Speed and not speed over the ground. The stall speed is affected by weight and flap setting and will change as the dynamics of the aircraft change (this also includes increased load of G forces in turns). The air speed versus power setting is affected by drag of flaps, open bomb bay doors, landing gear, windmilling engines, pitch of the nose, and rate of turn.

The following are a few hints to help get the most out of the game:

1. Be sure to speed up time whenever practical, especially over long straight stretches. (Most turns can easily be done at × 4 speed except for small heading changes.) Long, straight climbs out are best done at × 60.

The 460th strikes oil!

2. Wind down the runway shortens takeoff roll. Taking off with heavy loads is easier on windy days.

3. Max load take off is best done by pitching up 1 when you get just above stall speed and then immediately pitching back to 0. Quickly get the gear up and when the airspeed climbs to 140, bring the flaps up to 10 degrees. Then when the airspeed gets above 150, raise the flaps to 0 degrees and start your climb.

4. If an engine quits on take off, abort.

5. If you lose your IAS and VSI instruments due to damage, don't panic. You can still watch your altitude and time changes to get vertical speed. The stall warning will tell you when you are 5 mph above stall speed. Experience will help you to estimate your airspeed with altitude, load, and power setting.

6. If you lose navigation (XY readings), count blocks as they go by. Each block is ten miles square.

7. Plan each bomb run before you go there. Try to find the shortest route over the target flak. Set an Initial Point 20 miles before the target, track in to the target, drop your bombs, and close the bomb bay doors quickly, to avoid a loss in airspeed and wasting fuel.

8. You can always use Vis as an emergency field. Don't forget Foggia as it is closer to home and you can get there without going above 2000 feet.

CREDITS

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B-24
Apple Data Card

Starting the Game

Place game in your disk drive. Turn on your computer. Game will start.

IIgs owners will need to set their machines to normal speed before play.

When playing the Campaign game, you will have the option of using two drives.

Playing the Game

There is no joystick option in the game, the following keys operate the game:

I:	Pitch Down
J:	Bank Left
K:	Bank Right
M:	Pitch Up
Return:	Cancels fast time
Esc:	Aborts take-off
Crtl-A:	Bails out

All else is the same as for the Commodore version.

STRATEGIC SIMULATIONS, INC.

RUMANIA

PLOESTI NO. 69.1
ISSUED OCTOBER 15, 1942

AIR OBJECTIVE FOLDER

NO. 69.1

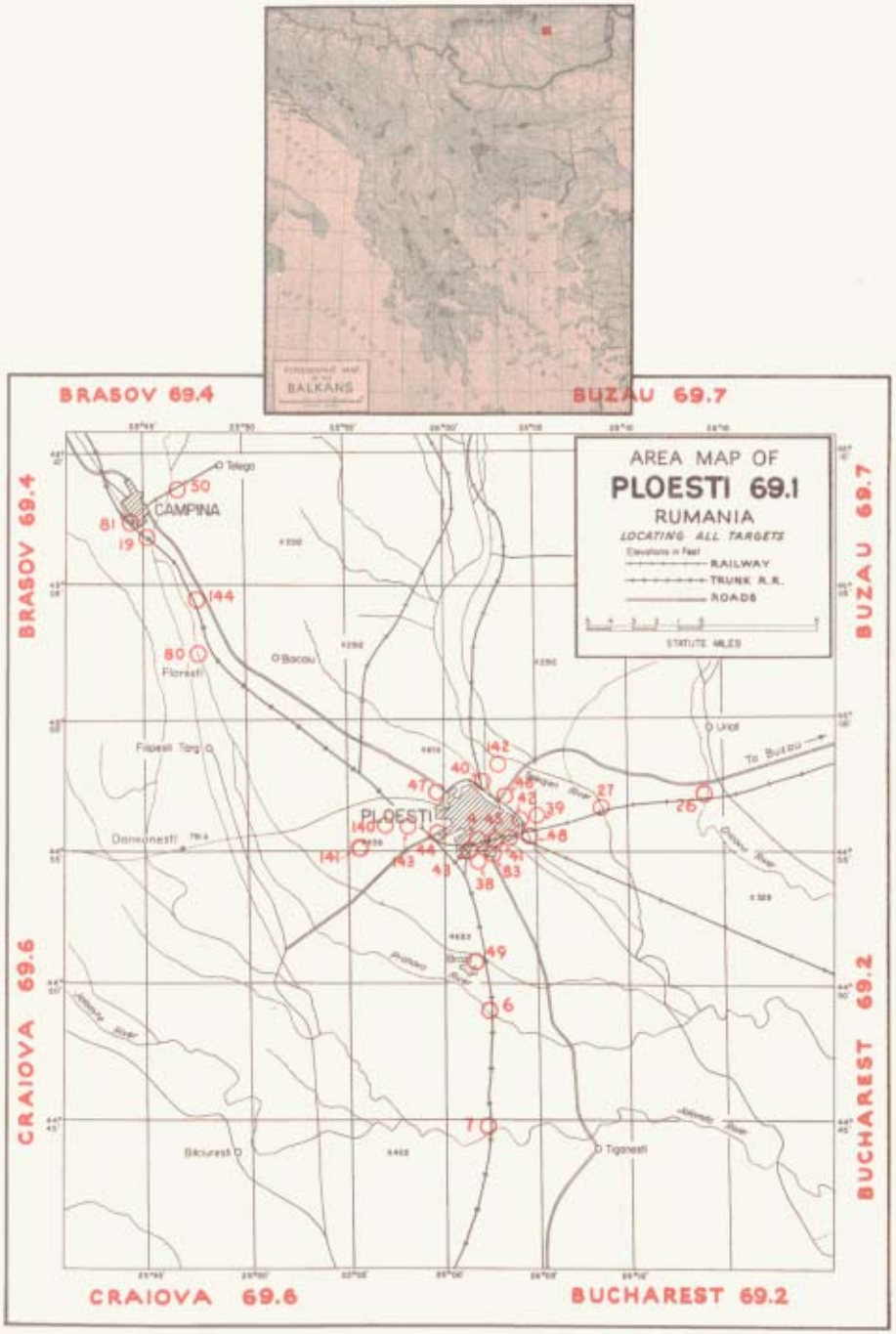
PLOESTI AREA

RUMANIA

INTELLIGENCE SERVICE AAF

CONFIDENTIAL

NOT TO BE TAKEN INTO THE AIR
ON OFFENSIVE MISSIONS



SUMMARY AND EVALUATION OF AREA

DESCRIPTION: The city of Ploesti and its suburbs constitute an area of approximately 19 square miles with an estimated population of 100,000. The city is situated in the Wallachian Plain 30 miles north of Bucharest; to the north of the city rise the foothills of the Transylvanian Alps and 5 miles to the east of the town the Teleajen River flows in a southeasterly direction. The northern region of the area contains numerous oil fields, particularly in the sector around Campina. Ploesti is almost the geographical center of the area as a whole and is the hub of rail and highway routes converging from all directions. Approaching the area from the south, attacking bombers would fly near the large city of Bucharest and its environs.

IMPORTANCE: The Ploesti Objective Area (69.1) is by far the most important area in Rumania, as it is the center of the Rumanian oil refining industry, which supplies Germany with approximately 35% of her petroleum products.

There are twelve large oil refineries in this objective area which produce approximately 86% of the refined petroleum products of Rumania and represent 96% of the total cracking capacity. These refineries have a capacity of 189,000 barrels per day and are now producing an average of 170,000 barrels daily. Ten of these refineries are located in the city of Ploesti. One of the remaining two is situated to the south of Ploesti, in the small town of Brazii and the other one 20 miles to the northwest in Campina.

The remaining 14% of refined petroleum products is produced in some 39 refineries throughout Rumania. Most of these plants are small and obsolete, and their production would have to be used for local consumption in the event that the major refineries were destroyed.

The Rumanian petroleum production (crude or refined) is of assistance to the Axis only if the oil can be effectively transported from the Ploesti area. Although the pipelines move a considerable amount of oil from Ploesti to Giurgiu, yet 80% of the oil leaving this area moves by rail. Continuous and effective operations against refineries and transportation objectives in Rumania would result in a serious blow to the German war effort.

DEFENSES AND VULNERABILITY: The defenses of the Ploesti area are quite strong and active. Local defenses exist for the various groups of refineries and possibly for certain of the vital transportation points. The Germans have carefully protected the vital parts of the refineries by the construction of protective walls around them. The storage tanks have been camouflaged with paint or by wooden sheds built over them.

A nightly barrage of forty to one hundred balloons is maintained over the city. It has been reported they are lowered at day and that at night they are raised from 6 to 10,000 feet. Included in the various protective defenses has been the construction of "dummy towns" to deceive attacking bombers. A dummy Ploesti was erected on the site of an encampment at Albesti about 7 miles east of Ploesti in June, 1941 and during the Russian attack this "dummy town" was purposely set on fire. It is also reported that a "dummy town" has been constructed about 8 miles northwest of Ploesti. The blackout of the town is said to be very good and the only light likely to be seen is a glow from some of the refinery plants that have not been stopped.

The fighter aircraft defenses of Ploesti were taken over by the German Air Force during the Balkan invasion in the spring of 1941 and since that time they have been shared equally with the Rumanians. There are three principal airdromes in the area supplemented by two alternate bases. Attacking bombers may also receive opposition from the enemy airbases in the Bucharest area to the south of Ploesti.

The outer anti-aircraft defenses of Ploesti form the perimeter of an oval extending to the north, with the north-south axis about 30 miles in length and the east-west axis about 20 miles long. The inner defenses of the city are very strong and in October, 1941, extended for five miles in a belt around the town, with the guns increasing in calibre towards the edge of the belt. In most cases the guns have been camouflaged by nets or "roofs" over them.

The front cover and pages 1 through 11 have been lifted out of an actual Ploesti Air Objective Folder used by the USAAF 460th Bombardment Group in 1944. SSI and John Gray would like to express their gratitude to our technical advisor, Leroy Newby, who flew some of the real raids over Ploesti and who made the folder available for reproduction.

TABULATION OF TARGET INFORMATION

TARGET NO.	TARGET NAME	APPROXIMATE COORDINATES	DESCRIPTION AND SIGNIFICANCE	TARGET CHART NO.
		OIL		
83	Astra Romana Refinery (Ploesti)	44° 55' N 26° 02' E	Cap 2,000,000 tons Yr or 18% of Rumanian total; cracking Cap 650,000 tons yr or 32% of Rumanian total. Largest refinery in Europe. Possesses imp modern cracking units. Most southern located refinery in Ploesti; identified by 4 large tanks as approached from south. Giurgiu pumping Sta is within target. (See photos A on page P-1; map on page M-3.)	83
39	Romano-Americana Refinery (Ploesti)	44° 57' N 26° 05' E	Cap 1,250,000 tons yr or 11% of Rumanian total; cracking Cap 400,000 tons yr or 17% of total. Third most imp Rumanian refinery with second largest cracking installations in Rumania. 3 mi E of Ploesti near Teleajen Station and 600 yds N of Buzau Ry. Prime targets in E part of plant. Includes 2 boiler pumps, power plant for Constantsa pumping Sta, cracking, distillation plants. (See photos B & C on page P-2; map on page M-3.)	83
40	Concordia Vega Refinery (Ploesti)	44° 59' N 26° 02' E	Cap 1,500,000 tons yr or 13% of Rumanian total; cracking Cap 210,000 or 8% of total. Imp cracking equipment. Refinery installation, 3 boiler houses, distillation plant. Covers area approx 400 x 550 yds. N Ploesti, E of Rd and Ry to Valenii de Munte, slightly N of Ploesti S Sta. (See photo A on page P-1; photos D & E on page P-3; map on page M-3.)	83
41	Phoenix Unirea Refinery (Ploesti)	44° 56' N 26° 03' E	Cap 700,000 tons yr or 6% of Rumanian total; cracking Cap 85,000 tons yr or 4% of total. Cracking plant prime objective and adjoins objectives in Target 43. E of main freight Yds (Target 4) adjoining Standard Petrol Block (Target 45), S of Ry to Buzau, first refinery reached from SE. (See map on page M-3.)	83
42	Dacia (Dacie-Romano) Refinery (Ploesti)	44° 57' N 26° 04' E	Cap 375,000 tons yr or 3% of Rumanian total. Small, Non-cracking, older equipment. 1½ mi W of Romano-Americana (Target 39). Compact with refining units located between two tank farms on NW and SW limits of plant. (See map on page M-3.)	83
43	Phoenix-Orion Refinery (Ploesti)	44° 55' N 26° 02' E	Cap 460,000 tons yr or 4% of Rumanian total; cracking Cap 85,000 or 4% total. Small but contains modern cracking units. Equipment concentrated. Includes a lubricating oil plant, one of few in Rumania. In S Ploesti within group of several others. (See photo A on page P-1; map on page M-3.)	83
44	Colombia (Colombia-Aquila) Refinery (Ploesti)	44° 56' N 26° 01' E	Cap 300,000 tons yr or 3% of Rumanian total; cracking Cap 150,000 tons yr or 5% of total. Prod high proportion of benzine. Cracking equipment prime objective. Other units, including refinery installation, distillation plant, and boiler house are compact. SW Ploesti, N of Ry sidngs NW of "Y" Ry Jc of Ry lines to Bucharest and Campina. (See photos F & G on page P-4; map on page M-3.)	83
45	Standard Petrol Block Refinery (Ploesti)	44° 56' N 26° 03' E	Cap 600,000 tons yr or 5% of Rumanian total; Cracking Cap 150,000 or 5% total. Modern cracking installations and lubricating oil plant. Vulnerable points include distillation plants, boiler house. Located in center of Ploesti refinery concentration. In SE Ploesti, adjacent to Phoenix-Unirea Refinery (Target 41), S of Buzau Ry. (See map on page M-3.)	83
46	Redeventza Refinery (Ploesti)	44° 57' N 26° 03' E	Cap 260,000 tons yr or 2% of Rumanian total. No cracking, old equipment. N Ploesti, N of Dambul R, S and adjoining Rd to Buzau, N of belt Ry around Ploesti. (See photo A on page P-1; map on page M-3.)	83

TABULATION OF TARGET INFORMATION

TARGET NO.	TARGET NAME	APPROXIMATE COORDINATES	DESCRIPTION AND SIGNIFICANCE	TARGET CHART NO.
		OIL — continued		
47	Xenia (Xenia-Redeventza) Refinery (Ploesti)	44° 57' N 26° 00' E	Cap 300,000 tons yr or 3% of Rumanian total. No cracking, older, less imp than others. Prin objective within refinery is distillation unit, just W of RR where it crosses Rd to Campina. In NW Ploesti, in triangle formed by intersection of belt Ry and Rd to Campina. (See photo A on page P-1; map on page M-3.)	83
48	Constantsa Pumping Sta (Ploesti)	44° 56' N 26° 05' E	Pumping Sta for oil to Constantsa. Sta terminal for numerous pipelines from Ploesti refineries. Pumps are old but large, vulnerable only to direct hits. E of Ploesti, near Teleajen Sta, S of Buzau Ry. From air appears as mass of storage tanks and one brick bldg which is the target. (See text on page T-9; map on page M-3.)	83
49	Creditul Minier Refinery (Brazii)	44° 52' N 26° 01' E	Cap 600,000 tons yr or 5% of Rumanian total; cracking Cap 175,000 or 7% of total. Equipped with large cracking units. Modern refinery, including only high octane gasoline plant in Rumania. Other vital points are boiler, power house, distillation plant. 6 mi S of Ploesti, 30 Mi N of Bucharest, on W side of Bucharest-Ploesti Ry, 1 mi E of Brazii. Refinery area in shape of triangle bounded by Ry and Rd to Brazii. (See map on page M-4.)	49
50	Steaua Romana Refinery (Campina)	45° 08' N 25° 44' E	Cap 1,750,000 tons yr or 13% of Rumanian total; cracking Cap 400,000 tons yr or 17% of total. Third largest European refinery. Large cracking installations, modern distillation units, and only important paraffin plant in Rumania. NE portion of Campina 10 mi NW of Ploesti. (See photos H & I on page P-5; map on page M-5.)	50
		TRANSPORTATION		
4	Ploesti Ry Yds	44° 56' N 26° 02' E	Prin Rumanian Ry center for marshalling of tank cars. Ry repair shops, roundhouse. Extend 1½ mi in ENE direction, S of city, width: 300 to 600 ft. (See photo A on page P-1; map on page M-3.)	83
6	Prahova R Br	44° 49' N 26° 02' E	Bucharest-Ploesti double-tracked Ry, carrying heaviest traffic in Rumania. Lattice girder construction. Length: 390 ft. (See map on page M-4.)	6
7	Jalomitsa R Br	44° 45' N 26° 02' E	Ploesti - Bucharest Ry. Double - tracked, carrying heaviest traffic in Rumania. Length: 300 ft. Height: 3 ft 4 in above high water. Iron superstructure. (See map on page M-4.)	7
27	Teleajen R Br	44° 57' N 26° 08' E	Ploesti-Buzau double-tracked RR E of Ploesti. Length: 726 ft. Height: 24 to 30 ft above normal water level. Iron superstructure. (See map on page M-4.)	27
26	Cricovul R Br	44° 57' N 26° 13' E	Ploesti-Buzau RR at Albesti. (See map on page M-4.)	26
19	Prahova R Br	45° 05' N 25° 45' E	Ploesti - Campina - Brasov double - tracked RR, S of Campina. (See map on page M-5.)	19
		POWER		
80	Floresti Electric Power Sta	45° 02' N 25° 48' E	Supplier for oil industry. Cap 6300 KW. 2/3 mi W of Baicoiu Ry Sta on Ploesti-Campina-Brasov Ry. (See photo K on page P-7.)	None
81	Campina Electric Power Sta	45° 07' N 25° 45' E	Supplies oil industry. Cap 22,950 KW. SW of Campina on Prahova R. (See photo J on page P-6; map on page M-5.)	None

TABULATION OF TARGET INFORMATION

TARGET NO.	TARGET NAME	APPROXIMATE COORDINATES	DESCRIPTION AND SIGNIFICANCE	TARGET CHART NO.
		MUNITIONS		
83	Concordia Munitions Fcty (Ploesti)	45° 56' N 26° 03' E	AA guns Schneider-Creusot type, artillery shells. Area approx 700 x 500 Yds. Bldgs brick, concrete roofs. NW Ploesti S Sta. (See map on page M-3.)	83
		MILITARY AIRBASES		
140	Strejnicul Adrm	44° 56' N 25° 57' E	2½ mi WSW Ploesti, 1½ mi SW Ploesti-Campina Ry and Ploesti-Darmanesti Rd Jc. Area 3000 x 3300 ft. Hangars, shops. GAF fighter base. (See map on page M-4.)	None
141	Targsorul Nou Adrm	44° 55' N 25° 56' E	SW Targsorul, 5½ mi WSW Ploesti. Area 3300 x 3900 ft. Hangars, fuel, all facilities. GAF fighter aircraft base.	None
142	Ploesti N Adrm	44° 58' N 26° 03' E	2 mi NE Ploesti, adjacent Buzau Rd, (No details available)	None
143	Ploesti Air Base	44° 56' N 25° 58' E	SW Ploesti-Campina and Ploesti-Darmanesti Rd Jc. Area 4950 x 3300 ft. Fueling facilities. Alternate of Strejnicul, Target 140.	None
144	Floresti Air Base	45° 04' N 25° 47' E	N of Floresti, NW Baicoiu, between Rd and Ry to Campina. Area 2100 x 900 ft. Fighter aircraft base.	None

... concluded

REVIEW OF TARGETS

TARGETS 4, 6, 7, 19, 36, 37 The transportation targets in the Ploesti Objective Area consist of 5 railway bridges and the main Ploesti railway yards. The bridges are situated on the lines which carry the Ploesti petroleum production to Central Europe, and the Russian Fronts. 80% of the oil leaving this area moves by rail.

The structures over the Prahova River TARGET 6 and the Jalomitsa River TARGET 7, south of Ploesti, are the largest of the group of bridges. The Prahova River Bridge TARGET 6, south of Ploesti, carries the pipeline to Giurgiu. The size and simple construction of all the bridges would indicate that their repair or reconstruction could be made in a short time.

TARGETS 38, 39, 40, 41, 43, 50 Priority should be given to these refineries as they are the largest in Rumania and contain important cracking units. All of the refineries include a considerable amount of tank storage, but, in general, this is not an economical target; the vulnerable units of the refineries being the stills, cracking installations, polymer, lube oil and hydrogenation equipment.

TARGET 40 The Constantsa Pumping Station should be considered in conjunction with TARGET 38. The former station could perform the pumping functions for the latter in the event of emergency.

TARGETS 140, 141, 142, 143, 144. The principal air fields in this area are grouped very near Ploesti with the exception of Floresti TARGET 144, which is situated between Ploesti and Campina. In addition to these bases there are numerous landing grounds throughout the area.

PHOTOGRAPHS OF PLOESTI AREA

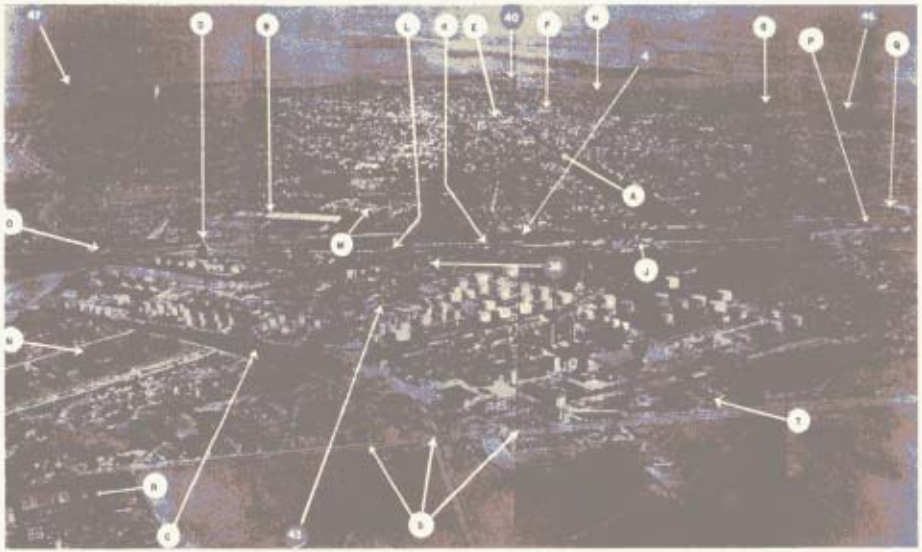


PHOTO A... Air view of Ploesti, Rumania – looking N from S Ploesti. Symbol Q locates **TARGET 83.**

LEGEND

LAND MARKS

- A. *Circle, end of boulevard and trees.*
- B. *Munitions and Shell Casing Plant.*
- C. *Railway Sidings of Astra Romana Refinery.*
- D. *Overpass over Railroad.*
- E. *Public Building Area.*
- F. *Technical School.*
- G. *Cometa Refinery.*
- H. *North Railway Station and Yards.*
- J. *South Railway Station.*
- K. *Noris Refinery.*
- L. *Alumina Refinery.*
- M. *Fratia Refinery.*
- N. *Astra Romana Storage Tanks.*
- O. *Railroad Roundhouse.*
- P. *Overpass over Railroad.*
- Q. *Concordia Shops.*
- R. *Construction Company.*
- S. *Main Roads.*
- T. *Chimney.*

REFINERIES

- 38. *Astra Romana.*
- 40. *Vega.*
- 43. *Orion.*
- 46. *Redeventa.*
- 47. *Xenia.*
- 4. *Main Freight Yards.*

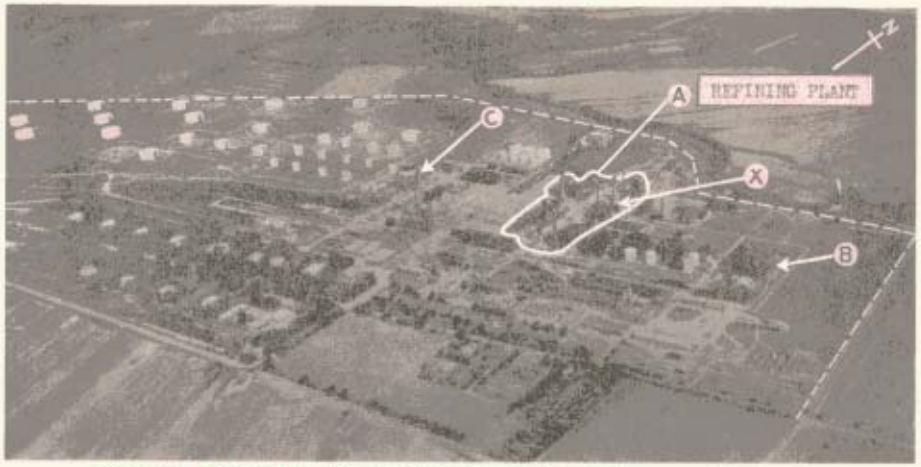


PHOTO B...TARGET 39 – Romano Americana Refinery. The area outlined and marked A contains the refining plant and is the vital point.
X–probably the Power Plant.
B–Plant dependent on A.
C–Plant dependent on A.

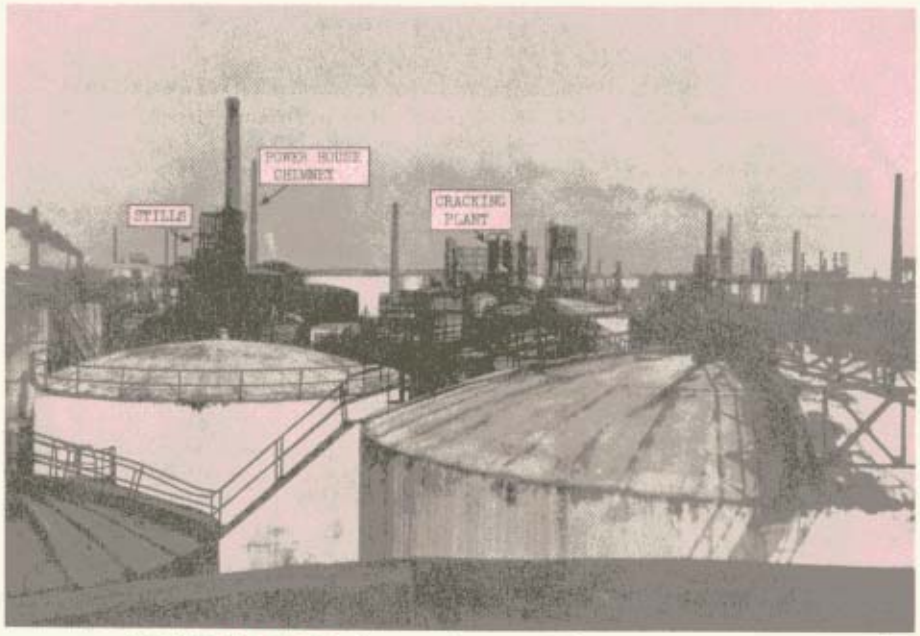


PHOTO C...TARGET 39 – Romano Americana Refinery, Prahova District.

PHOTO D...looking ENE. **TARGET 40** – Concordia Vega Oil Refinery.

PHOTO E...(1929), looking W **TARGET 40** – Concordia Vega Oil Refinery.
TARGET 46 – (in distance) Redeventza Refinery.

PHOTO F...TARGET 44 – Colombia Aquila Oil Refinery.
A – Boiler house.
B – Area containing Pipe Stills, Cracking Plant and Stabilization Columns.

PHOTO G...TARGET 44 – Colombia Aquila Oil Refinery.
A – Boiler house.
B – Area containing Pipe Stills, Cracking Plant and Stabilization Columns.

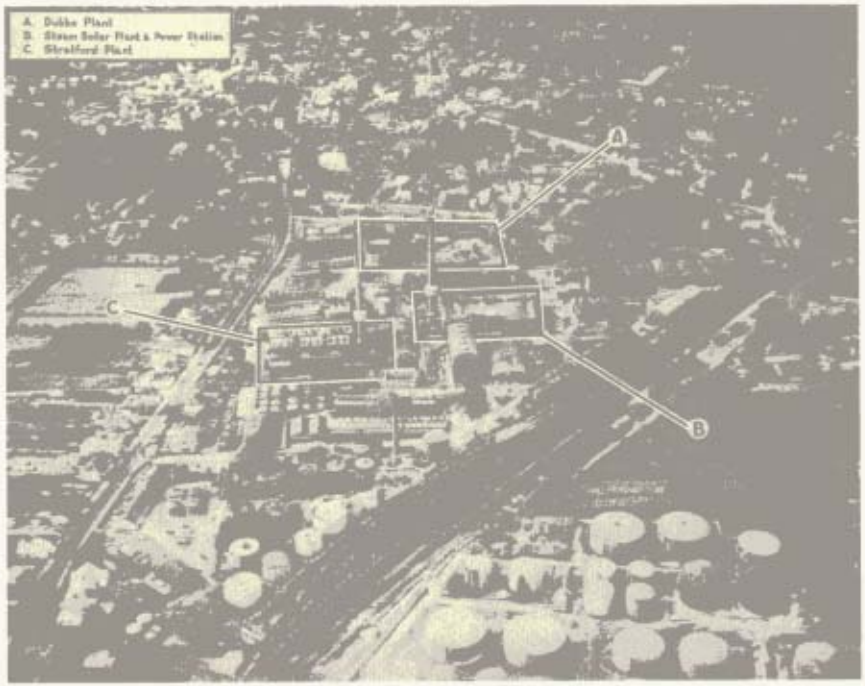


PHOTO H...CAMPINA, looking SW. **TARGET 50** – Steaua Romana Refinery.

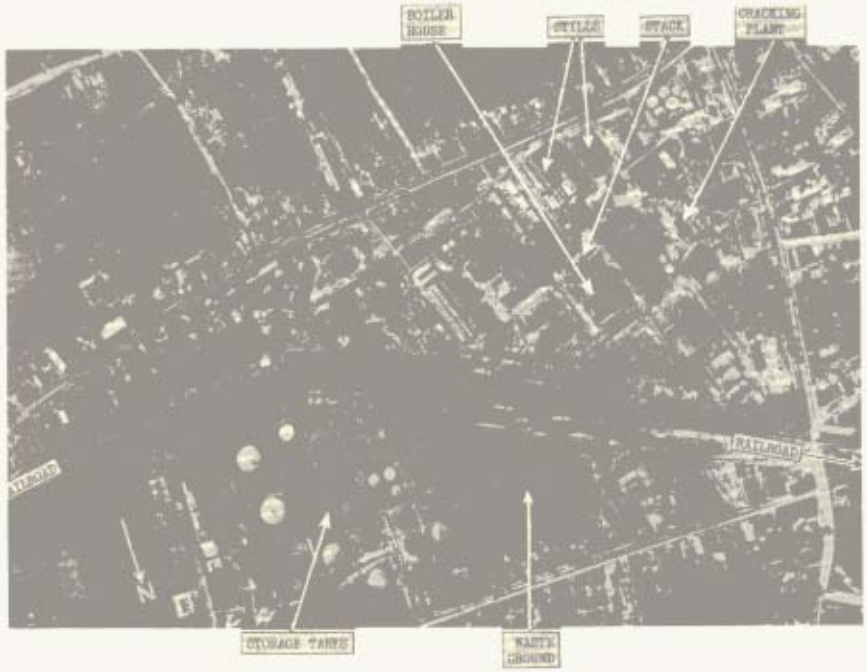


PHOTO I...CAMPINA. **TARGET 50** – Steaua Romana Refinery.

PHOTO J...CAMPINA (1929), probably looking W.
TARGET 81 — Campina Electric Power Station.

PHOTO K...FLORESTI (1929), looking W.
TARGET 80 — Floresti Electric Power Station.

SECRET

MISSION NO. 37 (Plan BAKER)

5 May 1944

BATTLE ORDER

1. Breakfast: 0345
   Briefing: 0450
   Transportation: 0525
   Stations: 0540
   Start Engines: 0615 – 0625
   Taxi Out: 0625 – 0635
   Take Off: 0630
   Assy Area: 0741 Spinazzola
   Target Time: 1007
   Time of Return: 1345

2. **Leader:** Major Billings
   Deputy Leader: Capt. Gray
   2nd Attack Leader: Major Newby

3. **Rendezvous:**
   Lead 460th (2000'),
   485th (3000') over Spinazzola.
   464th (2000') & 465th (3000')
   fall in behind at Spinazzola.

4. **Order Of Flight:**
   Loose column of wings:
   55th (460th, 465th first wave;
   464th, 465th second wave).

5. **Route Out:**
   Spinazzola to Andria to (x650, y180) to control point 20 miles south of Tirgoviste to IP 20 miles south of Ploesti to target.

6. **Point of Climb:** Follow lead group.

7. **Fighter Rendezvous:**
   P-51's at 0655 route out.
   P-47's at 0940 target.
   P-38's at 1035 route back.

8. **Bomb Load:** 10–500#G.P.

9. **Gas Load:** 2700 gallons.

10. **Bombing:** 155 MPH:
    460th – 16,000'; 464th – 16,500';
    465th – 17,000'; 485th – 17,500'.

11. **Route Back:**
    Rally 10 miles east of Tirgoviste, then to (x650, y140) to 20 miles south of Spinazzola to home.

12. **Radio Procedure:**
    Bombers to fighters VHF "A".
    Group to Group VHF "B".

13. **Air-Sea Rescue:**
    VHF "D"; Radio Op's on 4535 KC's.
    ARS Launches VHF "A".

14. **Bomber Call Signs:**
    460th Gp – CLEARSOUP Leader
    464th Gp – CLEARSOUP 2
    465th Gp – CLEARSOUP 3
    485th Gp – CLEARSOUP 4

15. **Fighter Call Signs:** PLATOON

16. **Recall Signs:**
    55th Wing – PORTRAIT

17. (a) Turn IFF on immediately after take off. Turn off at (x300) going out. Turn on again at (x300) on return.
    (b) Turn Carpet on when IFF is off and turn Carpet off when IFF is turned on.
    (c) Two (2) cartons of chaff will be loaded in each ship of the 1 st Atk Unit dispensing according to SOP, four units every twenty(20) seconds from IP until clear of flak.
    (d) Boxes will break off at IP for individual runs. Boxes will reform in Group Formation after rally.
    (e) At Control Point, 460th & 485th will execute a 360 deg. turn and then continue on course maintaining at least ten (10) minute interval between second and third groups.
    (f) There are no alternate targets. Only targets specified will be bombed.
    (g) Any convoy encountered will be avoided.
    (h) Group Leader will fire a double green flare to designate IP and as a signal for boxes to break off.
    (i) Box leaders will report results of bombing to Group Leader on 4040. Group Leader will report bombs away as follows: three (3) boxes MSOK; one (1) box MFOK.
    (j) This Flimsy will be turned into the Intelligence Officer at Interrogation.

B-24 AT PLOESTI

by Leroy W. Newby

Ploesti — 1598-1942

Underneath the Prahova Valley lurked one of the world's best-kept secrets—an abundance of latent energy in the form of crude oil; black gold, as it later would be known.

Nature tried to reveal its secret, as the local stained black sheep unwittingly advertised—those that had been lolling around in the gullies of Pacureti, where the crude oil gushed out in mud volcanos. No one paid attention to the blackened sheep. The unquenchable flames leaping out of the several crevices in the area also went unquestioned. The secret was safe.

Following his resounding success against the Turks, Michael the Brave set out with his army for Transylvania in Rumania, far across the Wallachian Plains. The warrior paused as he reached the entrance to the beautiful Prahova Valley, virtually impassable with its narrow gorges and untrodden forests, cutting and twisting its way through the Carpathian foothills and mountain. Impressed with its beauty and topography, he established camp there to prepare for the coming invasion of the future lair of the legendary Count Dracula.

The following year, 1599, Michael the Brave was crowned Prince Michael the Brave.

Two years later the Prince would be defeated by the Polish forces commanded by Zamoski, but his campsite survived, and one day would become the world's first oil boom town—Ploesti (Plo-ESS-tee).

Many consider the significant birth of the city to be 1856, when that first oil refinery was built (three years before Edwin L. Drake, a retired railroad conductor, struck oil in Titusville, Pennsylvania).

Oil's commercial possibilities became apparent when nearby Bucharest became the world's first city to have gas lighting.

Fifty years later there would be ten or more oil refineries ringing Ploesti, with names like "Romano Americana," "Concordia Vega," "Steaua Romana," "Unirea," "Astra Romana" and so on—names that would be so familiar to young Americans and Britons who would not yet be a gleam in their fathers' eyes for another dozen or so years.

As the beautiful city of Ploesti entered the oil age it was called the white town of black gold. Oil was always in the air. In the summer the fragrance of flowers competed with the aroma of oil. The winter snowflakes smelled of oil. Twilight was always purple in Ploesti. Often a traveler arriving by train would remark, long before he sees the city, "There is the smell of oil; we must be getting near Ploesti."

On June 11, 1942, the streets of Ploesti were filled with strollers. Parks abounded with picnickers. Swimming areas were packed with families enjoying themselves on a sunny day. It was a carefree community, not yet involved in the realities of war.

That night the first bombs fell on Ploesti. Just a few, and they landed without effect in the outskirts near the Astra Romana refinery, the largest in all Europe.

A new smell was in the air—the smell of war, and of death.

HALPRO

American military forces around the world had been reeling under Japanese attack ever since Pearl Harbor, suffering defeat after defeat. Home front morale was near the breaking point.

Suddenly there was hope. On April 18, 1942, Lt. Col. Jimmy Doolittle led 16 B-25's from the deck of the carrier Hornet straight to the heart of Japan—the famous "Thirty Seconds over Tokyo" that served notice America wasn't dead. Americans everywhere responded like their city had just won the World Series.

In early May, the Navy followed up with a striking victory at the Battle of Coral Sea. The Navy then began its slow march, island by island, toward the Japanese mainland.

Later in the month, against this backdrop of the taste of victory, the United States went for another morale booster when twenty-three bomb-laden B-24 Liberator bombers were dispatched from a Florida air base—destination Tokyo, nearly 10,000 miles away. When the attack force, known as HALPRO (Halverson Project No. 63), reached Khartoum, its plans were changed. The Japanese had captured the last stopping point Chenkiang on the east coast of China, so HALPRO was ordered to bomb the oil refineries at a place called Ploesti, Hitler's main source of oil for his war machine.

On June 5, the United States declared war on Rumania, Hungary and Bulgaria to make the Ploesti attack legal. These countries had previously declared war on the United States, but had been ignored up until this time.

The B-24 Liberator bomber had not yet been in combat in the European Theater under American colors; American Air Forces bombers had not yet made a bombing attack in that theater; American Air Force Bombers had never flown a 2500 mile round trip mission; but, on the night of June 11, thirteen HALPRO bombers departed Fayid, Egypt to achieve a triple first, even though only one plane made it to the target.

Little damage was done to the refineries, so the only significant result of their historical effort was to alert Germany that Ploesti could be had.

HALPRO Aftermath

"Gentlemen, this is the beginning. They will be back." announced Luftwaffe Colonel Alfred Gerstenberg at a hastily called meeting in Bucharest.

The German officers in attendance at the meeting were among the very few people in the entire world who even knew the attack had taken place. Ploesti inhabitants generally were unaware of the attack, as the few bombs dropped landed outside the perimeter of the city limits, and not on the refineries proper.

The Bucharest press ignored the incursion. The German press was silent. Neither the United States nor British press reported it. This historic American attack was not even mentioned in official military communiques. It was indeed a hidden mission. It never existed; but don't ever tell the over three dozen American flyers who were interned in Turkey that it didn't exist. Especially after they heard on the radio a few weeks later that England-based American bombers had just made America's *initial* bombing attack on German occupied territory.

While the fact of the mission was suppressed, the result had a profound effect on the world. From that moment on two great world forces began preparing to face each other in one of history's greatest military battles.

Gerstenberg, soon to be promoted to general, began developing a defensive mode for the Ploesti oil refinery, the likes of which had never been seen, or even dreamed.

He built a perimeter pipeline around Ploesti, linking all the refinery units. His plan was that if some storage tanks were hit and the refineries themselves were intact, neighboring tanks could be used on a pool basis. The same would hold for destroyed refineries with intact storage tanks.

The key to all this was in positioning exposed pipeline above ground so that it could easily be repaired. This proved to be very successful. One problem, though, was created by the objections of the various plant managers to sharing their facilities.

Allied Intelligence knew nothing about this pipeline arrangement until the capture of Ploesti! Circular cement and brick walls up to twenty feet high and nearly four feet thick were erected around sensitive areas within each refinery. Each oil tank had a wall around it to contain the contents if it were ruptured by bombs.

Two dummy "Ploestis" were constructed to try and fool the bombers, one about thirteen kilometers northwest and the other about twelve kilometers east of the real Ploesti. Gerstenberg's flak defense is a story in itself.

Mission Planning

The planners on the other side of the Atlantic were more directly concerned with the effort of the 9th Air Force, whose bombing activities were paving the way for the British 8th Army in its westward advance from Egypt into Libya. British air bases were being set up behind their advancing lines as fast as possible. When Benghazi was captured, the U. S. 9th Air Force moved in with bases of its own . . . bases that were two hundred miles closer to Ploesti than Fayid was.

In January, 1943, Churchill and Roosevelt were meeting in Casablanca, 1600 miles west of Benghazi, to ponder the next move once Rommel was defeated in Africa. Churchill, knowing Stalin favored a Balkan invasion to help his cause and Roosevelt opposed it, chose not to bring up the matter at the meeting. Others brought it up and Roosevelt vigorously opposed the move, as expected. The plan was dropped in favor of a Sicily invasion.

The subject of Ploesti came up at the meeting; its destruction would help relieve pressure on both the Sicily invasion and the Russian front.

An additional reward for the destruction of Ploesti's oil refineries would be the elimination of more than a third of Germany's gasoline and oil production for its war machine.

Once Ploesti had been marked for destruction and the 9th Air Force had been tapped for the job, there remained only the method of carrying out the objective, and timing. The timing was simple: somewhere between the end of the Africa campaign and the Sicily invasion. The how of the attack was not quite as easy.

Colonel Jacob Smart was assigned the task of destroying the Ploesti oil producing capability. He considered many factors never before faced by a planner of a bombing mission: how to get a formation of nearly 200 bombers, without fighter escort, to a target about 1200 miles away, flying over unfamiliar terrain with no available maps; how many bombs must be sacrificed for extra bomb bay fuel tanks; how to effect the maximum destruction on twelve refineries; and how to get the bombers home.

After much soul searching, Smart came up with the key to his dilemma . . . a low level attack. The unprecedented audacity of the plan was overwhelming to many, but it seemed to address most of the main voiced concerns. A formation of bombers flying at ground level would certainly escape radar detection enroute and near the target area, and increase the chances of surprise. Not having to climb to and maintain an altitude of 20,000 feet would conserve gasoline. Assigning each bomber a specific aiming point would assure far more accuracy in bombing than was possible with high level bombing.

Even with a Norden bombsight, a refinery was difficult to knock out from high level. The reason was that a refinery usually occupies about a square mile of land, and on that property are about half a dozen key structures: pumping station, powerhouse, cracking tower, still, boiler house and others. A formation of bombers dropping bombs can have a beautiful bomb pattern (excellent for a factory) but all six structures scattered over a mile of land are unlikely to be badly damaged. Individual aiming points would also reduce civilian casualties and damage.

Flak batteries would have a far more difficult time hitting bombers at such close range, and hugging the ground would cut the German fighter's sphere of attack—two points highly favored by the crews. Of course, on the negative side was the vulnerability to small caliber anti-aircraft fire and barrage balloons. A psychological plus might be the opportunity for normally defenseless airmen, now armed with .50 caliber machine guns, to fight back at their ground tormentors.

The defeat of Rommel in May enabled the allied planners at the Trident Conference in Washington to move up the Sicily invasion to July 10th. With General Marshall's strong backing, the Ploesti attack received the conference's official blessing. TIDAL WAVE was born.

TIDAL WAVE

On August 1, 1943, an event took place that directly touched millions of lives. Over 1700 airmen were briefed on a daring 2500 mile round trip to bomb Hitler's main source of oil for his war machine. They were to fly at tree top level to Ploesti, Rumania, to bomb at 20 to 30 feet. An unprecedented military maneuver . . . intended to surprise the enemy.

A general visited the five air bases involved and told the airmen that if they destroyed their targets and NONE of them returned, the mission would be considered successful.

He further told them that Ploesti oil was so crucial to Germany's waging of the war that the destruction of their targets would probably end the war by Christmas. The enormity of their objective was not even known to the planners.

Think of the lives that would be touched by this one mission. How many soldiers' lives were lost between Christmas, 1943, and May, 1945, when the war in Europe finally ended? Certainly hundreds of thousands. How many Jews were executed in the holocaust during that period? Probably millions.

Those millions of lives were unknowingly touched by those 1700 airmen: by the kiss of death if the mission failed. Or by the extension of their lives if it succeeded.

The plan was to dispatch 178 B-24 bombers, each with four 1000-pound bombs and two bomb bay fuel tanks. They were to fly in formations of about 35 planes per group. At the Initial Point (start of the bomb run) they would split into waves of from three to ten abreast and go in at 20 to 30 feet off the ground.

Their objective was to destroy the seven largest refineries at Ploesti.

The mission was fraught with disaster from the outset: one plane crashed on takeoff, killing most aboard. The lead plane, containing the mission navigator who had received a special briefing on how to find Ploesti, crashed into the sea. The deputy lead plane, containing the only other navigator to receive the special briefing, aborted and went home.

While over the Mediterranean, the giant air armada flew over a German submarine which had surfaced to charge its batteries. The sub no doubt radioed ahead what they had seen—so surprise may have been lost as they got under way. Soon after reaching land, they came across a cloud formation ranging up to 16,000 feet. Some went through and some went over the top. The result was that two groups, with their short-fused bombs, got 60 miles ahead of the other three groups, and visual contact was lost.

When the two lead groups got within 60 miles of Ploesti, flying at tree top level to stay under the radar, they encountered a summer squall that made visual navigation difficult. In the mist they turned at the wrong town and followed the barely discernible railroad tracks that were expected to lead them to the refineries at Ploesti . . . but the tracks they followed led to Bucharest, some 30 miles south of Ploesti. This errant course took them directly over the Fighter Command Center for all Rumania. Murphy's Law was working overtime this day.

When they realized their error one group turned and headed north to Ploesti, and the other circled east of the city and came in from the north. Both lost groups attacked refineries assigned to other groups. No doubt anyone in their shoes—having traveled all that distance and with a bomb bay full of bombs, 30 feet off the ground, moving at over 200 mph in strange territory, and having no idea just where their assigned target was—would have done the same thing. "There's a refinery dead ahead, let's hit it, and get out of here!"

Meanwhile the other groups found their way to the briefed Initial Point and went down the correct railroad tracks to their assigned targets. And what a surprise they had waiting for them!

The groups attacking their assigned targets were astounded to see smoke and fire awaiting them, but they had no choice but to plow through the flames. One group of twelve bombers went into the mess and only nine came out. Some came out only to see other bombers converging on them from the side. Some had to bank their plane to avoid a 100-foot smokestack. Their training had not prepared them for this turn of events, but they all reacted in exemplary fashion. They knew why they were there; one pilot, his plane trailing flames for a hundred yards, and no hope of crash landing his plane or bailing out his crew, steered his coffin into a powerhouse.

The three groups that went to their briefed Initial Points made successful bomb runs on their assigned targets and knocked them out of service for from several months to forever.

The actual battle lasted less than half an hour, and in that time more firepower was expended than at two Gettysburgs; more men were killed in the air than on the ground; five men were awarded the Medal of Honor for gallantry (the Air Force awarded only 36 in the entire war.)

For those surviving the hell of Ploesti, the worst part was yet to come—the trip home in the unfriendly skies of the Balkans: most planes were short on gas and many had engines or controls shot out. Many were shot down as they fell behind the protection of the formations. Over twenty landed in neutral countries. Several ditched in the sea.

Of the 165 planes reaching the target only 88 made it back to Africa. Only 33 of those were airworthy to fly a mission the next day.

Production at Ploesti was cut by 40% but activation of some unused facilities returned it to full force in a couple of months.

Sadly, the war did not end by Christmas, and the terrible death toll continued to mount until May of 1945.

The failure to destroy the entire target as planned was not due to the air forces being turned back. In fact, no U. S. Air Force combat unit was ever turned back by enemy action!

15th Air Force

On August 1, 1943, the crew of *Hangar Queen* did not yet exist as an entity, but each of its eventual ten members heard the stupefying news at their training centers where they were learning their respective military specialties: pilot, navigator, bombardier, engineer, radioman, and gunner. In October they would meld into a combat air crew, a fighting team, as part of a new offensive weapon being prepared for the final assault on Germany.

This new weapon was not yet in existence on the day Ploesti became somewhat of a household word, but by October, military planners would be forming a new powerhouse, the Fifteenth Air Force, to be based in Italy under the command of Gen. James H. Doolittle. Six heavy bomb groups from the Twelfth Air Force in North Africa would form the nucleus, and would be augmented by fifteen Heavy Bomb Groups being groomed for the Eighth Air Force in England, to be diverted to the Fifteenth under the new plan.

The Fifteenth Air Force would have four main objectives, with priorities as follows:

1. To destroy the German Air Force in the air (by making it come up and fight) and on the ground, wherever it was within operational range.
2. To participate in POINTBLANK (the joint Eighth Air Force and Fifteenth Air Force bomber offensive), which called for the destruction of Germany's war-making capabilities. Factories, oil refineries, oil transportation, and naval bases would be key targets.
3. To support the battle of the Italian mainland (mainly attacking communication targets in Italy along the Brenner Pass route, and also in neighboring Austria).
4. To weaken the German position in the Balkans.

The High Road to Ploesti

A few excerpts from chapter 4 of *TARGET PLOESTI: View from a Bombsight* depict the *Hangar Queen* crew's reaction to its first trip to one of the toughest targets in the world.

★ ★ ★ ★ ★

On the last day of our long stand-down, we all dressed in Class A uniforms and reported to the drill field. Gen. Nathan O. Twining, Commanding General, Fifteenth Air Force, had come to pin the Air Medal on those who had completed five missions. It was a nice shot in the arm and give us a running start for the events of the following morning, when the blue yarn on the stage map went to our mecca Ploesti—for the first time.

"Gentlemen, today is a milestone in the history of the 460th," began the briefing officer as the impact of the blue yarn settled in. "We make our first strike on Ploesti, the heart of Germany's oil production." He certainly had everyone's attention. We had been awaiting this moment, and all the side conversations and shuffling in our seats came to a quick halt.

He told us that our specific target was the Xenia Refinery on the northwest edge of the city. Xenia was one of the smallest of the important refineries in the Ploesti area, but its tank farms (storage tanks) were a vital cog in the overall oil production for the entire area. It had been virtually ignored in the low-level raid of last August, so it began handling most of the crude from the neighboring oil wells, which could not be put through the larger refineries for awhile, due to the damage inflicted on them. Xenia had been rested for the previous few months, but was being pressed back into service again because of the renewed attacks on the big refineries.

He then told us that our job was to destroy the tank farms and the nearby distilling unit—and the 460th could do it! There was no cheering or back slapping as happens after a pep talk in a football locker room. Our low murmur of appreciation said all that needed to be said at the time.

He told us we wouldn't be alone up there. About a dozen or so other groups would be hitting various targets in the Ploesti complex at the same time. He continued with more details about the location of the IP, bombing altitude, and other information. Then another officer stepped up to the podium with the "gloom report."

"There are several hundred anti-aircraft guns at Ploesti!" Our hearts sank as we thought of what just four guns could do at Mostar. "However," he continued, "they are deployed in a large circle twelve miles in diameter surrounding Ploesti, so it isn't as bad as it sounds." Pause. "It just means there is no way into the target without flak activity."

The officer wouldn't quit. "The German high command is probably aware by now that Ploesti is a prime target for the Fifteenth Air Force, so we can expect not only the Balkans air force to meet us enroute, but a portion of the Central air force too. Fighter action will be heavy, but our fighter protection is improving and if we keep up the great tight formation, the fighters will be the least of our worries." We all chuckled inwardly at the words, "we" and "our" coming out of someone not planning to come along.

While flying high above the clouds, I found the sight from my side window so dramatic, I forgot about Ploesti for a few moments. I was struck by the contradiction of the beauty of 500 four-engine bombers in orderly formation, a thousand contrails streaming behind, forming a spectacular skyscape on a peaceful morning, with its purpose soon to be revealed.

When my bomb-pin pulling detail was completed, I began calculating the input data for my bombsight. I checked my bombing tables for the type of bombs aboard, plotted the target temperature and barometric pressure reading, and read off the information to be entered into the bombsight. After setting the bombsight drift angle for the expected degree of drift on the bomb run, I sat and waited for the moment to turn on the sight. The heater that was supposed to be able to heat a five-room house was not working. The higher we climbed on course, the colder it got, several degrees about every thousand feet. The temperature was expected to be minus sixty at the target, and it seemed that cold inside the drafty nose compartment—but I knew it would become warmer once we arrived. Finally, I turned on the bombsight. Although I had previously double-checked my figures, I rechecked them. All seemed OK.

The evening after a mission, a lead bombardier was either a hero or a bum. If he lined up the run-in badly, and the entire target was missed and perhaps a plane or two went down, he would not be looked upon very kindly. Nasty words were sometimes spoken—and not in jest. On the other hand, if he did a good job and the target was clobbered, his compatriots couldn't buy him enough drinks and say enough nice things to him. *Would I be a hero or a bum tonight, providing I got back?*

I was roused from my musing by the report of fighters about three thousand feet above us, but after a few anxious moments we were assured they were P-51 Mustangs. That little exchange reminded me I had yet not put on my flak suit and flak helmet. Neither had Sherm (our navigator), so we helped each other into our flak suits—not really that difficult a task, but much easier with help.

A flak suit always reminded me of a "sandwich board" carried by "sandwich men" roaming the streets of downtown Pittsburgh, with their advertising signboards hanging front and back, hinged at the shoulders. Ours, of course, were made like a canvas apron hanging front and back with many overlapping sections of metal, smaller but thicker than a playing card, sewn into individual pockets. This gave protection against spent flak, which was just as deadly as fresh flak if it hit your body. A flak suit would not stop a machine gun bullet.

By now the undercast was breaking up and it looked like about a 5/10ths undercast dead ahead. Not good, but not as bad as 10/10ths. We might luck into a good sighting.

Sherm was making log entries every five minutes and I knew he would tell me, at some point about ten minutes from the IP, if there were any appreciable changes in the target weather figures so that I could refine my bombsight data. I was far more nervous about my upcoming *performance* over the target than I was about the danger itself.

"Newb, the weather data looks OK to me." Sherm finally said. "Roger," I replied with much relief. *No changes; all I have to do is find the target.*

"Lead bomb bay doors are opening," called out nose gunner Bob Kaiser. I immediately opened our bomb bay doors and flipped the bomb "train" switch, and eight amber lights lit up on the board overhead, one for each bomb position. Sherm nudged me. I arose and he pointed out the right window. I stood transfixed as I gaped at the incredible sight of Ploesti. *My God, I'm here!*

Over The Target

There wasn't a natural cloud at our altitude, but it was cloudy high over Ploesti. Not over the city proper, but the groups of black polka-dot clouds formed a protective ring around the city, a concentration over each of the refineries under attack. It was reminiscent of the circled wagon trains of our Wild West days. Two miles above us were several white polka-dot cloud formations—compliments of the flak batteries to the high-flying B-17's. The Fifteenth Air Force was simultaneously attacking all of the refineries encircling Ploesti. At least this would spread the flak around. The black clouds were from German Flak 37 guns that fired 88mm shells weighing over twenty pounds, at a rate of fifteen to twenty rounds per minute. These could reach 26,230 feet and were intended for our B-24's. The white clouds were from Flak 39 guns that fired 105mm shells weighing over thirty-four pounds. These were for the B-17's at 30,000 feet. B-17's were also favorite targets for the relatively new Flak 40 guns that fired a 128mm sixty-two pound five ounce shell, and were mounted on railroad cars.

The black and white clouds came in various sizes and shapes. Small, sharply jagged clouds were the fresh ones, and they were potentially harmful if they were too near you. If you saw the red flash that occurred just before it was surrounded by the sharp cloud, there was a good chance for some of it to hit your plane. Seeing a red flash was a relatively good sign though, because it meant you were still alive. Larger, more rounded puffs were past history. They had done their damage but were mute reminders that there were more from where they came.

The really startling sight was the nearest huge block of black puffs in the sky— at our altitude, and off to the right. We weren't there yet and they had already set up a barrage of flak! Then I saw why. *Somebody's* target was ablaze. The distinctive narrow column of black smoke that always identified a burning refinery target was pushing up through the low natural white clouds that seemed to be trying to protect the cluster of targets. High above the smoking target, bomb bays empty, thirty-five B-24's were turning southeast, heading for home, their crews thankful to have made it through the most concentrated flak barrage of their experience so far—although they had left a crew behind at Ploesti.

The principle of the barrage, as opposed to predicted fire, was to establish a large box in the sky consisting of bursting flak at or about the bomb release point. This huge flak box was much larger than the mass of a bomber formation, in order to make certain the formation entered the living box of streaking steel. The flak gunners, each firing a round every three or four seconds, would simply keep it filled with flak bursts. They knew the formation of bombers could not actually be stopped. Their only hope was to hit a plane or two and cause the formation to split open in order to avoid the careening aircraft, thereby reducing bombing efficiency.

Our instructions were very clear. Fly into and though the box of flak. No evasive action; just get in and get out. A straight line is the shortest distance. . . .

This preview had me sweating, and we were only spectators so far! You had to see the spectacle to appreciate the enormity of Ploesti as a bombing target. The cloud cover below us only added to the drama. Some fifteen bomber formations were moving relentlessly toward their respective targets, and most of the bombardiers were having difficulty finding their targets through the clouds. They would only get one shot at their target in a situation like this.

The conspicuous groupings of black or white puffs at our altitude, in an otherwise cloudless environment, were like giant neon signs pointing to the several oil refineries surrounding the city. I really did not know which cluster of flak clouds was signaling our target. Or had our hosts not yet begun their reception?

Fifteen miles northwest of the city was another sky sign, indicating the whereabouts of Steaua Romana, the second largest refinery in the area, and one of the most successfully hit targets in the low level mission a year earlier. I began to see why it took many hundreds of bombers to make a dent in this massive oil-producing arena, and why we would no doubt be back many times before it was completely subdued.

Twenty miles seems far enough away, but I could see the trip up to the bomb release point was going to be a busy one. The sought-for target checkpoints would not yet be seen, and the 5/10ths undercast didn't help in trying to orient ourselves. It's funny how your mind works in moments like this. I had a mental picture of people hiding in basements, and I said a little prayer for them. Actually they were fairly safe as we had no intention of hitting the city proper, and very few bombs were likely to land in residential areas unless they were located right next to the refinery. Of course, with this nearly solid cloud cover, things could be different. In the great land-air battle of 1 August, 1943, very few homes were hit by American bombs.

"Major James, get ready to make a turn to seventy-seven degree heading at 1416 hours," announced navigator Wood. At 1415 hours the lead plane dipped its wings and began the turn onto the bomb run. They had turned a minute earlier than Sherm had calculated. By then I had left the side window and leaned over the bombsight to locate the target through my own private front window, my oblique photo in hand. Glancing back and forth between the photo and through some cloud holes to the target area, I finally saw what looked like oil tanks, and settled my eye into the eye-piece of the bombsight.

Up until now I had done nothing toward establishing range with my rate (of approach) knob. So before I got too serious about establishing my rate of approach, I tried to locate the actual aiming point. Instead of a two-abreast tank farm running generally east and west, the tank farm in my bombsight eye-piece was *square* shaped. I checked my target photo and had my worst fears confirmed.

"Sherm!" I hollered. "Did we turn early?"

"Yeah," he answered. "A minute early. Why?"

"This is the wrong target!"

"Right or wrong, this is the one we are going to bomb," interjected the pilot. He wasn't going to be a hero.

"Yes, sir!"

Not only was the tank farm the wrong shape, but there were a lot of strange-looking structures immediately to the right of the cluster of oil tanks. This certainly was not Xenia, because their tank farm was all by itself. However, we had a straight shot into some target, so I decided to make the best of it.

At least we had one thing going for us: the group that was assigned to this target had not yet shown up, so we did have first crack at it. I would not like to be racing someone for it. Also, being first in meant you would not have the target obscured by bomb bursts from a previous group. Usually it took awhile for the smoke to clear from a first attack, and if they hit some oil tanks the smoke would not clear at all. We would not be very popular with the group assigned to this target, but that was a small worry.

I wenent back to my sight and chose a new ai aiming point—the large tank at the centnter of the farm. A cloud umbrellalla was over the target and extendeded about five or six miles in front of of the aiming point, which I could stistill see from my viewing angle. *I will nonot be able to see the aiming point foifor the final twenty or thirty seconsds of my bomb run!*

This is development would require a bombinging technique known as offset bombinging, in which a bombardier locates as a check point at the extreme left (or rr right) on the lateral cross hair and anonother at the near end on the fore andnd aft cross hair. This of course after firsirst locating the intersection of the crososs hairs on the actual aiming point.

I wasas in luck as there were some good refreference aiming points that could bebe seen through the space betweenen the scattered clouds. *Ploesti I am goinning to lick you!*

But fi first a word from the defenders. They haoad other ideas. I had been hearing ig the muffled bursts right outside ourur plane, and had been seeing the flak ik in my bombsight telescope. Their acaccuracy was emphasized when a piece œ of flak came through our nose compartirtment side window and narrowly mimissed Sherm's head. I felt the plane rorock from the nearby explosion. One of of our planes received a flak hit, and an en engine caught fire. I couldn't see it anand I was just as glad to be spared tl the sight. Knowing it was there was bad id enough. Some described a flak barrrrage as "standing out in an open fiefield during a severe hailstorm." There wawas nothing you could do about it. No plplace to hide—just pray a lot.

During the next few seconds I made some minor knob corrections to keep the two cross hairs on their respective offset aiming points, and by that time the little warning flag had popped into view in my eye-piece. That told me there were about eight seconds until "bombs away".

Even though I could no longer see the aiming point, the center tank in the tank farm, my offset aiming points were holding up. Satisfied that my cross hairs, while centered on a cloud were actually on the aiming point, I came out of the bombsight, sat back on my haunches, armed the bombsight with a flick of my finger, and took one more peek at my masterpiece in the eyepiece as the reference aiming points disappeared under the clouds. I looked over to my buddy Sherm and gave him a cocky Ballantine's "OK" sign.

We both watched the external sighting angle index pointer closing in on the dropping angle index pointer. When the indices met I heard a click within the sight as the electrical contact was made, and simultaneously, the louder sound of the bomb release as the bomb shackles expelled the bombs from the bomb racks.

"Bombs away!" I reported, with a trace of pride in my voice. I tried to play it cool but I couldn't, as I knew I had done well. The eight amber lights on my control panel winked off one at a time, so fast that they all seemed to extinguish at once. It was final confirmation that the bomb run was over.

"Bomb bay doors closed," I added, this time more matter-of-factly, as I flipped the appropriate switch. Despite the minus sixty outside, and not much warmer inside, I was soaked from my waist up. Even my feet were warm, for a change. As I crawled over the bombsight to view my handiwork Sid told us, from his rear turret, "Beautiful release. Everyone behind us toggled on time. We have good formation, so if the 'world's greatest bombardier' got a 'shack' we have a perfect mission."

Now I really began to sweat because soon everyone might know how I did. I could follow the group's bombs for about twenty of the thirty-seven seconds it took the bombs to reach the ground, and watched the pinpoints disappear into the clouds, hopefully headed for the cluster of oil tanks. As we banked away from the target, Major James came on the intercom with "We've been working for the government up to now, but from here on in we are in business for ourselves!" I don't believe it could have been stated better. *Our sole job now was to get home.*

The flak was the most that I had ever been exposed to and I really hadn't seen much of it, so the rube in me took over for a moment and I climbed up and looked out the side window. It was awesome. In between some old, soft black flak clouds a bright red flash would appear, to be immediately surrounded by a sharp, jagged black shroud which would soften into the familiar flak cloud. Then another, fifty yards away. And another. And another. This ubiquitous display of death's calling cards begged the question as to why none of it had hit me.

I was enthralled by it all, and innocently pushed my face up against the window like a kid in a candy store. Nothing but a thin section of Plexiglas and my flying goggles between the potentially hot steel and my face—a foolish move on my part.

We never did learn what refinery we sighted on. It may have been Columbia-Aquila or possibly the big prize Astra Romana. It certainly was not Xenia, although many returning crews thought it was.

Somebody hit Astra Romana, the largest refinery in Europe. We liked to think that was our target, as it was shut down for nearly a month and did not get back to any significant production level for another month. It never again achieved more than 39 percent of its previous peak performance in the fall of 1943. Phoenix-Orion, which was entirely surrounded by Astra Romana and was the fifth largest refinery at Ploesti, was destroyed—never to reopen. Xenia lucked out that day.

The trip home was uneventful.

★ ★ ★ ★ ★

Ploesti was blasted by a total of 25 bombing attacks before it was finally subdued. British bombers hit the refineries four times at night, dodging searchlights and flak. The Americans preferred daylight bombing on their turns at the beleaguered target.

In all, 6627 Allied bombers braved the flak-infested skies of Ploesti, destroying 84½ tons of oil production for each ton of bombs dropped.

The price for destroying Hitler's main source of oil was high—339 bombers were shot down at Ploesti.

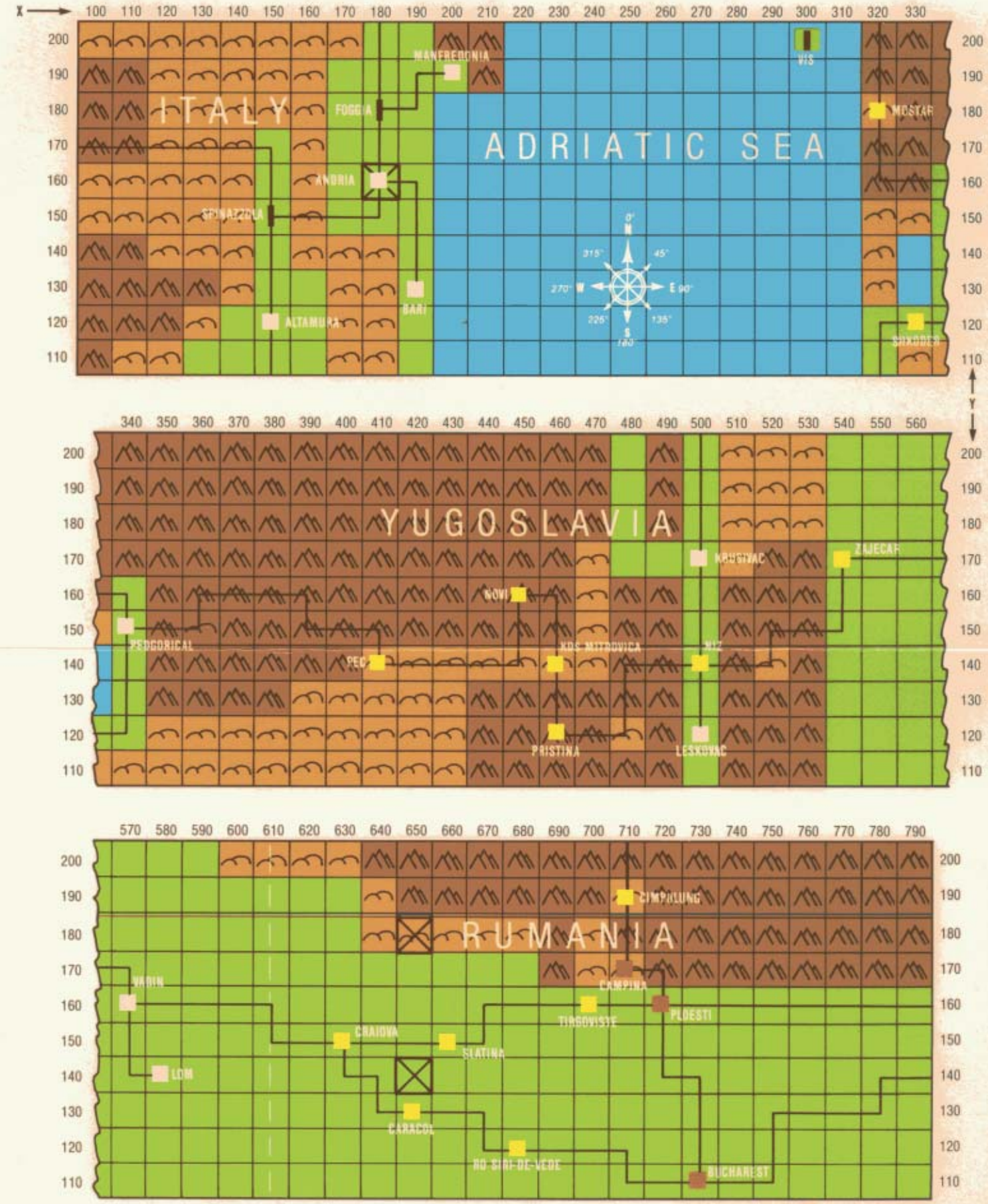
The entrance to the beautiful Prahova Valley, known to its founders as the "white town of black gold" was known to Allied bomber crews as the *graveyard of bombers.*

LIBERATOR CLUB

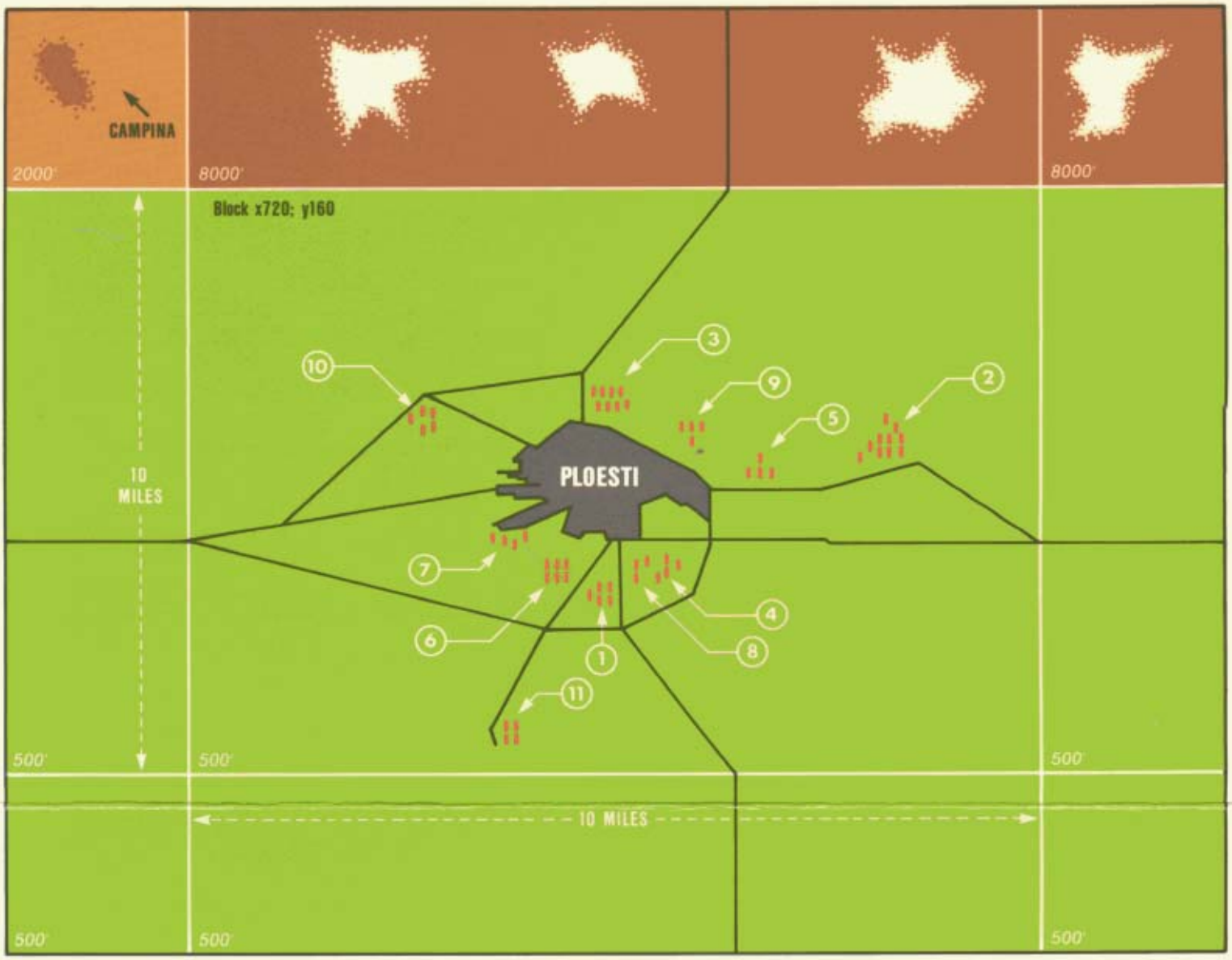
The LIBERATOR CLUB was formed October 1968, sponsored by the San Diego Aero-Space Museum. It is an international organization for anyone who was associated with the Liberator airplane during WW II. Membership is also open to production personnel, historians, writers, modelers, WW II aviation enthusiasts and relatives of crewmen. Ground crews and support personnel of groups and squadrons are also welcomed. PURPOSE OF THE CLUB: to promote the significant role of the Liberator Airplane in WW II and to call attention to the outstanding achievements of the airplane and its crewmen, and to encourage the preservation of articles, photographs and documents connected with the history of this airplane. The LIBERATOR CLUB holds no reunions or regularly scheduled meetings. Membership dues support a newsletter, published twice a year, and the acquisition of photos, books and exhibit materials. Books, posters, photos, models and jewelry identified with the Liberator are available upon request.

Address: **LIBERATOR CLUB**
P. O. BOX 841
SAN DIEGO, CA 92112

STRATEGIC SIMULATIONS, INC.

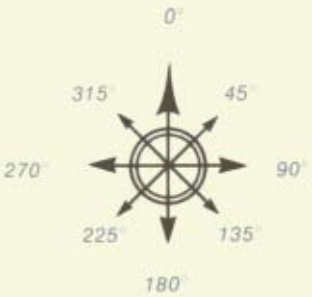


Water (0')
Fields (500')
Hills (2000')
Mountains (8000')
Airbase
Town without flak
Town with light flak
Town with heavy flak
Fighter escort rendezvous point
Road

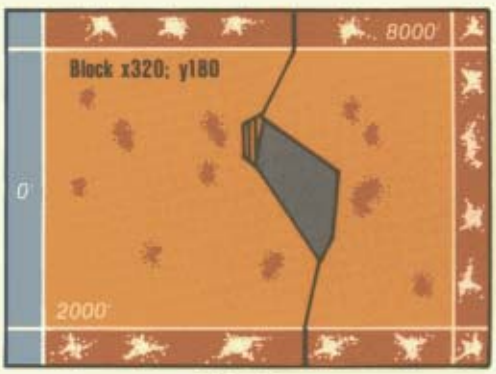


1. ASTRA ROMANA (x724.92; y162.94)
2. ROMANO-AMERICANA (x728.34; y165.91)
3. CONCORDIA VEGA (x724.99; y166.57)
4. PHOENIX UNIREA (x725.69; y163.46)
5. DACIA-ROMANO (x726.44; y165.41)
6. PHOENIX-ORION (x724.42; y163.44)
7. COLOMBIA-AQUILA (x723.76; y164.04)
8. STANDARD PETROL (x725.34; y163.46)
9. REDEVENTZA (x726.08; y165.90)
10. XENIA (x722.76; y166.19)
11. CREDITUL MINIER (x723.94; y160.40)
12. STEAUA ROMANA (x717.36; y175.48)

MOSTAR (x325.18; y186.50)
BUCHAREST (x733.15; y115.96)



B-24



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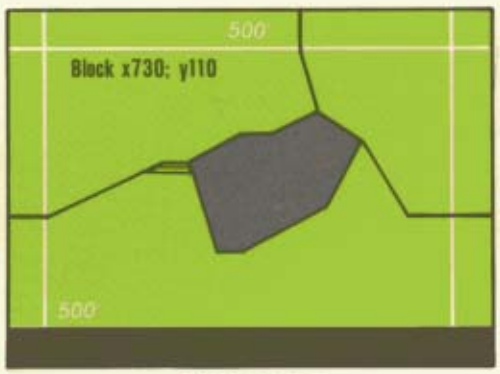
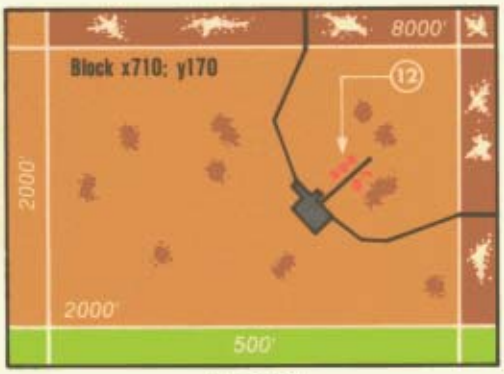


BUCHAREST



CAMPINA