

RESTRICTED

PILOT TRAINING MANUAL

FOR THE INVADER

A-26

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RESTRICTED

OFFICE OF ASSISTANT CHIEF OF AIR STAFF, TRAINING
HEADQUARTERS, U.S. AIR FORCE



U.S. AIR FORCE
GENERAL
1944-1952

REPRODUCED

FOREWORD

This manual is the text for your training as a A-26 pilot and airplane commander.

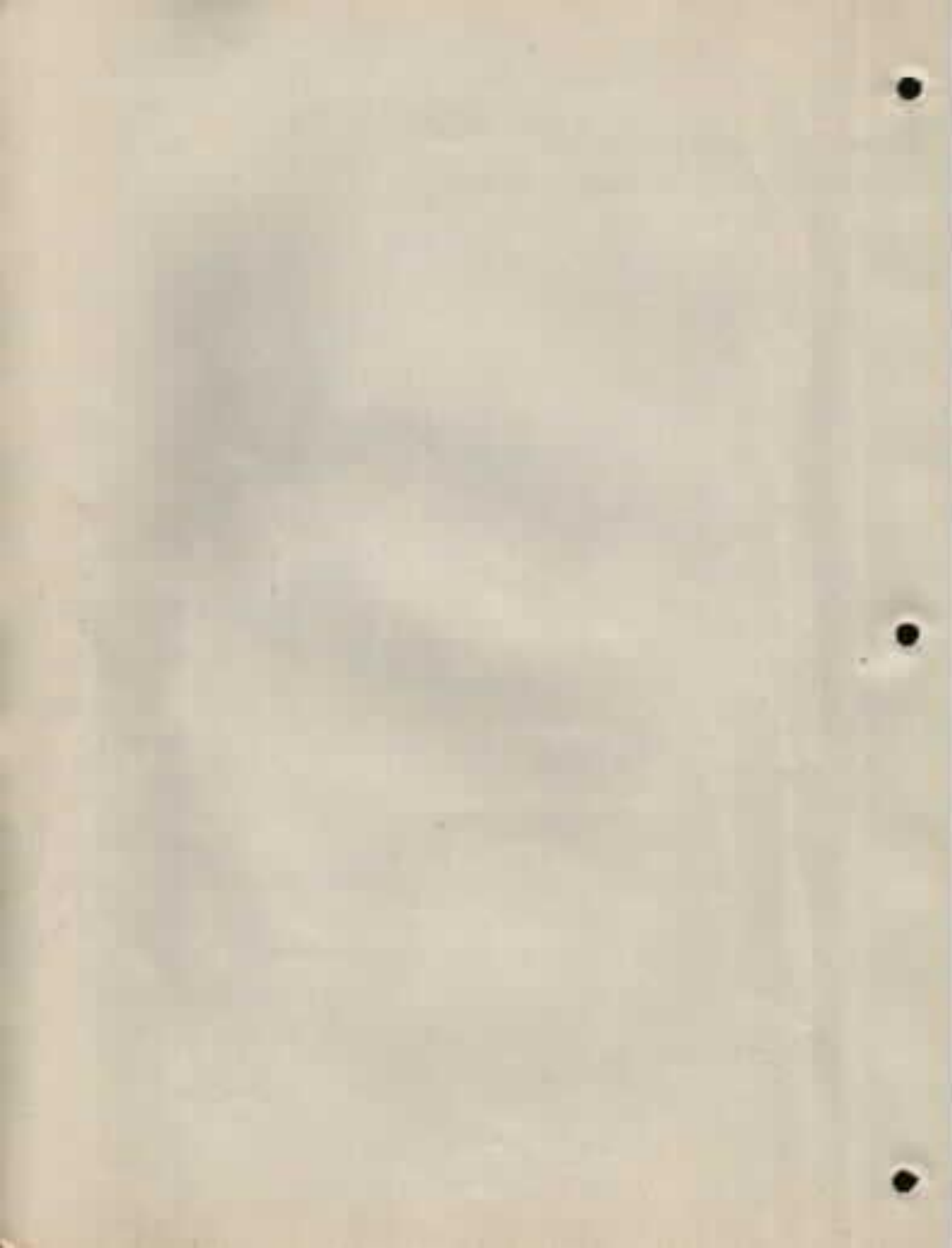
The Air Forces' most experienced training and supervisory personnel have collaborated to make it a complete exposition of what your pilot duties are, how each will be performed, and why it must be performed in the manner prescribed.

The techniques and procedures described in this book are standard and mandatory. In this respect the manual serves the dual purpose of a training checklist and working handbook. Use it to make sure that you learn everything described herein. Use it to study and review the essential facts concerning everything taught. Such additional self-study and review will not only advance your training, but will alleviate the burden of your already overburdened instructors.

This training manual does not replace the Technical Orders for the airplane, which will always be your primary source of information concerning the A-26 so long as you fly it. This is essentially the textbook of the A-26. Used properly, it will enable you to utilize the pertinent Technical Orders to even greater advantage.



GENERAL, U.S. ARMY,
COMMANDING GENERAL,
ARMY AIR FORCES



The A-26

INVADER



The Douglas A-26 Invader has been described as a glorified A-20, a fighter-bomber, and a cross between a B-26 and an A-20. Actually, the Invader is a new airplane, one of the first of the planes designed to meet the tactical requirements of the theater commanders. The A-26 attack bomber has tremendous striking power. One of the most versatile aircraft ever designed, it approaches the speed of a fighter and has the range and bomb load of a medium bomber, in addition to packing a nose-full of concentrated cannon and machine gun firepower.

Combat

While the Invader was born of combat experience, it has not yet had the opportunity to

measure up to, or exceed, the tremendous results that the designers and the AAF theater commanders expect of it. As this book is being written the first A-26 groups are leaving for combat. You, as a new A-26 pilot, soon will be a member of one of those groups. So it is up to you to write the combat section with results. Make no mistake about it, the Invader is not a small boy's flying machine. It is a high-speed airplane with a high wingloading. It requires exact procedures, top flying technique, and headwork to exploit its great striking power. So use this manual, study it, learn it! It represents the combined experience to date of the factory engineering test pilots, AAF test pilots, and your instructors, who have many hundreds of hours of A-26 know-how on which to draw.

General Description

The A-26 is a 2-engine mid-wing attack bomber of all-metal construction.

WINGS

Two-spar, full cantilever, laminar flow. (Span, 70 feet; maximum width, 10 feet; maximum depth, 18½ inches.)

FUSELAGE

All-metal structure of alclad skin shaped and reinforced by aluminum alloy ribs, bulkheads, and longitudinal members. (Length with bombardier nose, 51 feet 3 inches; length with all-purpose nose, 50 feet 9 inches; maximum width, 5 feet 2 inches; height, 5 feet 10 inches.)



ENGINES

Two Pratt & Whitney R-2800-27 Double Wasp, developing 2000 brake Hp each on takeoff.

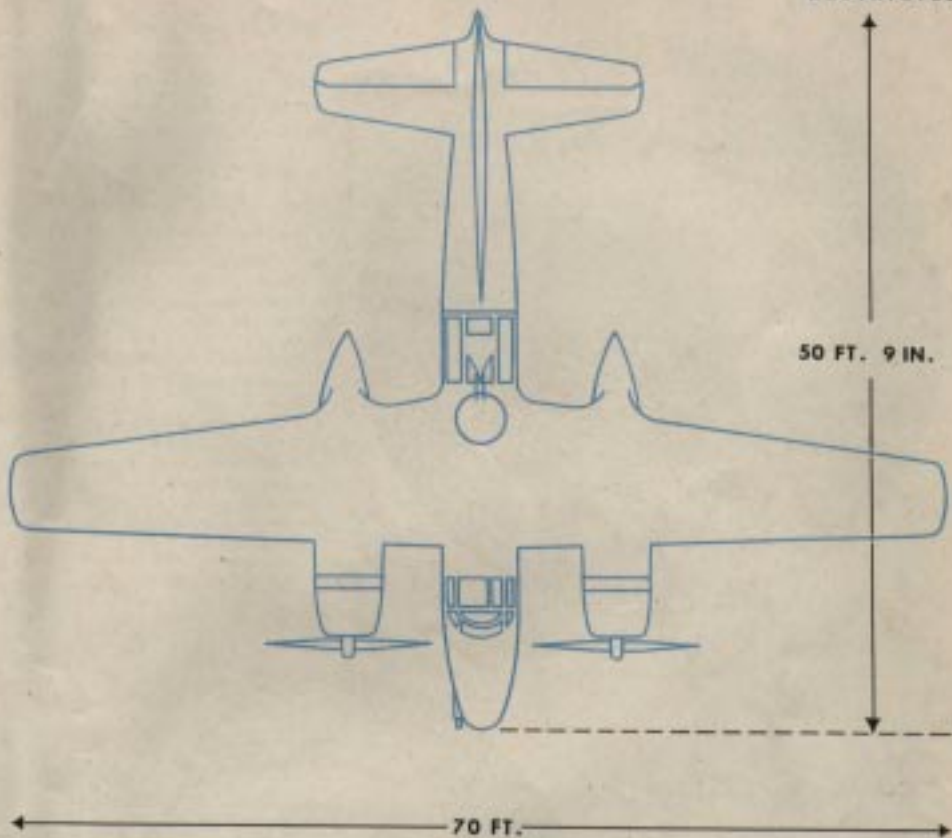
PROPELLERS

Three-bladed (12 feet 7 inches in diameter), constant-speed, full-feathering hydromatic Hamilton Standard.

LANDING GEAR

Full retractable, hydraulic tricycle gear.

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The A-26 is an extremely versatile airplane. It is designed with two interchangeable nose sections to meet exact tactical requirements.

1. ALL-PURPOSE NOSE.

There are six combinations of armament, as follows:

- a. Six .50-cal. machine guns.
Crew 2
- b. One 37-mm. cannon and four .50-cal. machine guns.
Crew 2
- c. One 37-mm. cannon and two .50-cal. machine guns.
Crew 2
- d. Two 37-mm. cannon.
Crew 2
- e. One 75-mm. cannon and one 37-mm. cannon.
Crew 3
- f. One 75-mm. cannon and two .50-cal. machine guns.
Crew 3

Nose Section

2. BOMBARDIER NOSE.

Crew 3

Plexiglas nose.

Fitted with bombsight and controls, and two fixed .50-cal. machine guns.



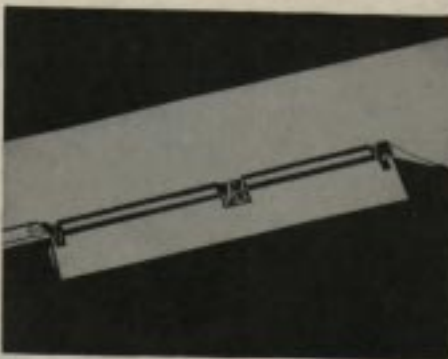
OUTSTANDING FEATURES OF THE A-26

LAMINAR FLOW WING

The laminar flow airfoil is shaped with its thickest dimension nearer the trailing edge of the wing than in the normal airfoil. The laminar flow airfoil is more efficient at high speeds approaching compressibility. It is the most modern and best designed high-speed wing known today.



NEW HIGHLY EFFICIENT FLAP



This new Douglas double-slotted flap is described by the designers as "the flap of the future." It extends outward and downward, causing greater lift and much greater drag than conventional flaps.

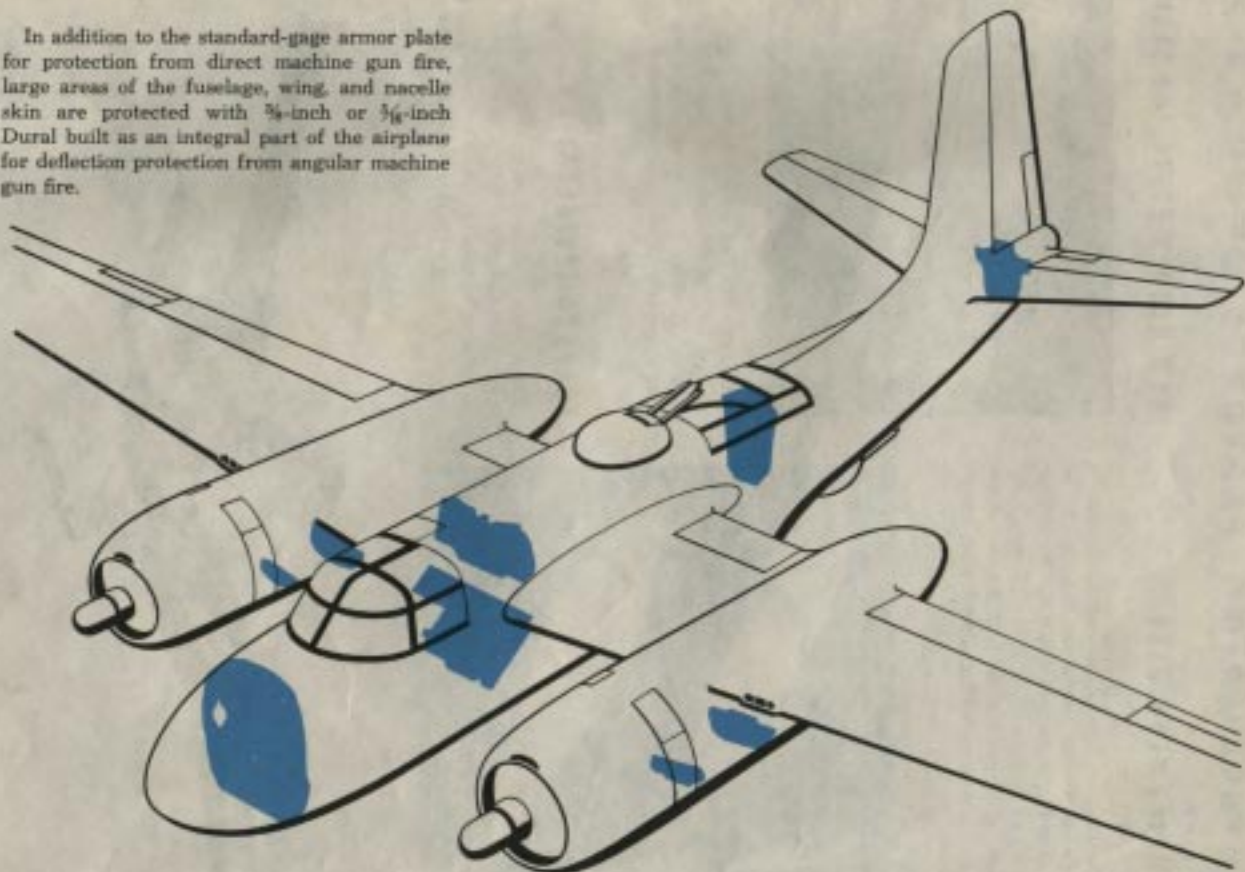
TORPEDO INSTALLATION

Two torpedoes may be carried in the bomb bay, released electrically by pilot with the same pushbutton he uses for bomb release. A special torpedo director sight is installed for pilot's use.



10 **BUILT-IN ARMOR PLATE**

In addition to the standard-gage armor plate for protection from direct machine gun fire, large areas of the fuselage, wing, and nacelle skin are protected with $\frac{3}{8}$ -inch or $\frac{1}{2}$ -inch Dural built as an integral part of the airplane for deflection protection from angular machine gun fire.

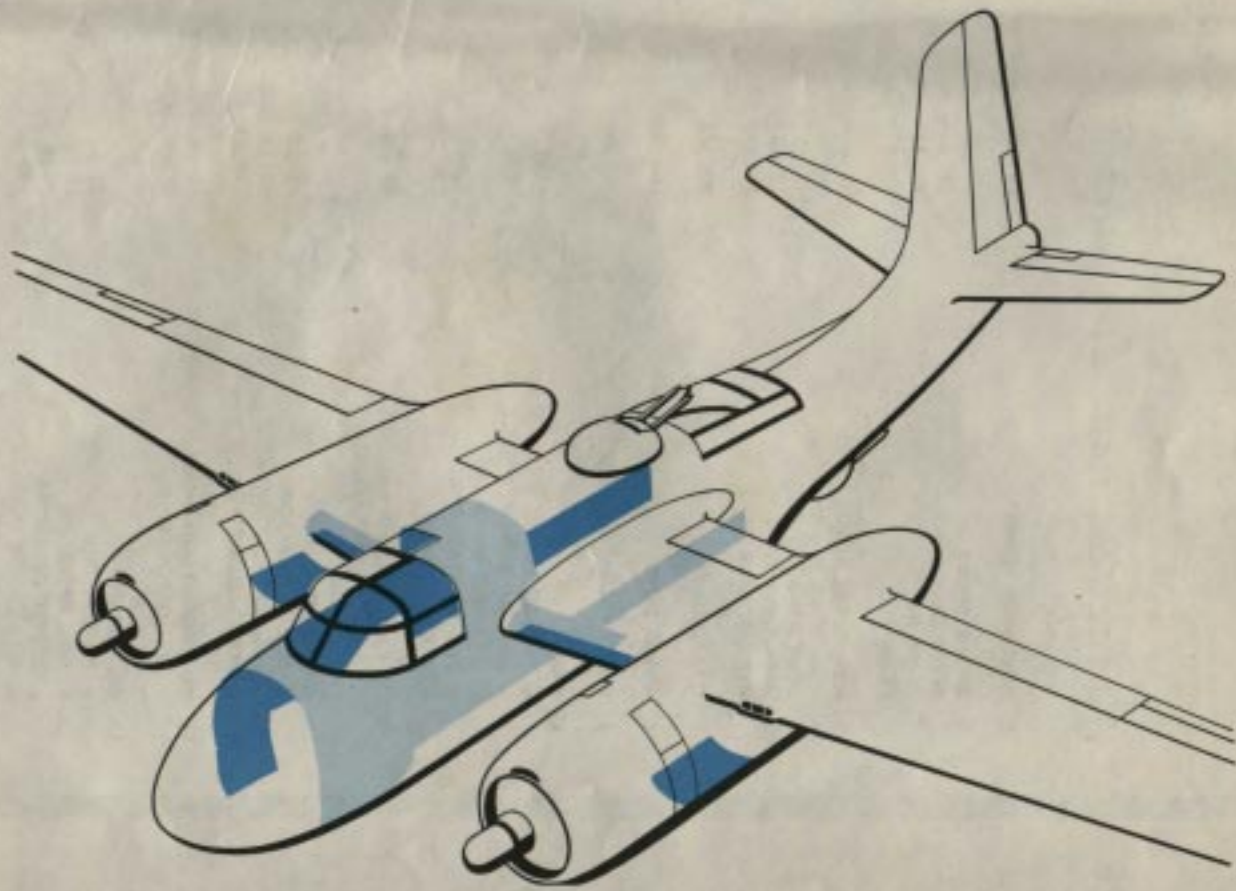


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ARMOR PLATE

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DURAL PLATE

A-26

Capacities and Limitations

1. NOSEWHEEL SWING	36° either direction
2. DIVING SPEEDS	
26,000 lbs. Gross	425 IAS
32,000 lbs.	400 IAS
35,500 lbs.	360 IAS
3. LEVEL-FLIGHT SPEED	No limitation
4. OPEN BOMB BAY DOORS	
WITH SPOILERS	425 IAS
WITHOUT SPOILERS	240 IAS
5. FLAPS DOWN	208 IAS
6. WHEELS DOWN	160 IAS
7. TAKEOFF MANIFOLD PRESSURE	52" Hg.
8. RPM	
a. TAKEOFF AT FULL INCREASE RPM	2700
b. GROUND RUN-UP APPROX. 25"	2000
c. MAGNETO CHECK LOSS	100
d. FULL DECREASE RPM	1200 + or - 50
e. IDLING	550-700
9. OIL CAPACITY (each tank) FULL	30 gals.
4.5 gals. FOR EXPANSION	
10. OIL TEMPERATURES	
a. MIN. FOR TAKEOFF	40°C
b. DESIRED OPERATING	60-75°C
c. MAX. ALLOWABLE	100°C
11. OIL CONSUMPTION—NORMAL OPERATING	10 qts./hr/engine
RATED POWER	27 qts./hr/engine
12. OIL PRESSURE	
a. NORMAL IDLE	25 psi
b. MIN. OPERATING	50 psi
c. DESIRED OPERATING	70-80 psi
d. MAX. ALLOWABLE	100 psi

13. FUEL CAPACITY
- | | | |
|----------------------------|--------|------------|
| a. MAIN TANKS | (each) | 300 gals. |
| b. AUX. TANKS | (each) | 100 gals. |
| c. BOMB BAY TANK | | 125 gals. |
| TOTAL NORMAL | | 925 gals. |
| d. FERRY TANK | | 675 gals. |
| TOTAL FERRY | | 1600 gals. |
14. FUEL PRESSURE
- | | | |
|--------------------------------|--|----------------|
| a. MIN. ALLOWABLE | | 13 psi |
| b. DESIRED OPERATING | | 16-18 psi |
| c. FUEL BOOSTER PUMP | | |
| ENGINE NOT RUNNING | | LOW 7-9 psi |
| ENGINE NOT RUNNING | | HIGH 15-18 psi |
15. FUEL CONSUMPTION—NORMAL CRUISE approx. 150 GPH
16. CYLINDER-HEAD TEMPERATURE
- | | | |
|------------------------------------|--|--------------------|
| a. MIN. BEFORE RUN-UP | | 120°C |
| b. MIN. BEFORE MAG CHECK | | 150°C |
| c. MAX. BEFORE TAKEOFF | | 205°C |
| d. MAX. ALLOWABLE (AUTO RICH) | | 260°C (1 hr. only) |
| (AUTO LEAN) | | 232°C |
| e. MAX. BEFORE STOP | | 150°C |
17. HYDRAULIC
- | | | |
|--|--|-----------------|
| a. CAPACITY OF SYSTEM | | approx. 8 gals. |
| b. SYSTEM PRESSURE | | 850-1000 psi |
| c. ACCUMULATOR | | 650 psi |
| d. EMERGENCY AIR PRESSURE | | 450-575 psi |
| e. GEAR EXTEND AND RETRACT 160 IAS | | 12 sec. |
18. ELECTRIC
- | | | |
|---|--|--------------------|
| a. FLAPS EXTEND AND RETRACT 160 IAS | | 12 sec. |
| b. COWL FLAPS | | 5-10 sec. |
| c. OIL COOLER DOORS | | 15-20 sec. |
| d. VOLTMETER AT 1700 RPM | | 26-28.5 volts |
| e. AMMETERS (200 MAX. EACH) | | max. 20 amp. diff. |
19. INSTRUMENT SUCTION 4.2" Hg. + or — .5"
20. WEIGHT AND BALANCE
- | | | |
|------------------------------|--|-------------|
| MAC | | 97.5 inches |
| CG—LIMITS % OF MAC | | 18-32 |

Engines



The A-26 has two Pratt & Whitney R-2800-27 engines. They are twin-row, 18-cylinder (nine cylinders in each bank) air-cooled radials, each containing an internal single-stage, 2-speed, gear-driven blower.

Engine Limits

Your instructor will insist on absolute precision in engine operation. Take his word as gospel. The engines of your airplane are the most powerful, most dependable engines built. To maintain them and use them properly, you must not deviate from the power settings indicated on your new color marker instruments and on your Cruise Control Chart.

With these aids your engines will remain efficient and dependable. It may be a tired gag, but there were never truer words than:



"A Pilot's Best Friend is His Motor!"

OBSERVE THESE LIMITS

	SEA LEVEL	to	ALTITUDE
1. Takeoff	52" Hg. and 2700 rpm		Full throttle
2. Rated Power	42" Hg. and 2400 rpm (LOW blower)		See new instrument color markings and Cruise Control Chart. Note that manifold pressure drops with increase in altitude.
Note: Do not exceed rated power settings except for takeoff and in case of emergency, and then never for more than 5 minutes.			
3. Continuous Cruising (62.5% Power Line)	33" Hg. and 2100 rpm (LOW blower)		See new instrument color markings and Cruise Control Chart. Note that manifold pressure drops with increase in altitude.
4. Mixture Control			
LOW Blower—	Above 33" and 2100 rpm Operate in AUTO RICH		Below 33" and 2100 rpm Operate in AUTO LEAN
HIGH Blower—	Above 30" and 2100 rpm Operate in AUTO RICH		Below 30" and 2100 rpm Operate in AUTO LEAN
Do not attempt to lean your mixture further by pulling the mixture control back beyond the AUTO LEAN position. AUTO LEAN is the only position which gives you a proper lean mixture.			
5. Cylinder-head Temperature	AUTO LEAN Do not exceed 232°C.		AUTO RICH Do not exceed 260°C.
6. Engine Dive Limits	Always use a minimum of 15" to 20" Hg. in dives. Never dive the airplane with power off. Rapid cooling, followed by application of power, damages the engines.		
7. Oil Temperature Limits	40°Cto.....100°C		
8. Oil Pressure Limits	50 psito.....100 psi		

NEW INSTRUMENT

COLOR MARKINGS

All new AAF aircraft will have color zones plainly marked on the faces of most of the instruments on the panel. As soon as possible, the instrument panels on all AAF aircraft now in use will be marked with the same color zones. This applies not only to the A-26 but to all other AAF aircraft, as well. The color zones are:

Blue zone . . . indicates AUTO LEAN operating limits.

Green zone . . . indicates AUTO RICH operating limits.

Yellow zone . . . indicates caution limits.

Red line . . . indicates maximum allowable operating limits.

There will be matching colors on the mixture control to correspond with the blue (AUTO LEAN) and the green (AUTO RICH) zones on the instruments. In the A-26, for example, after you have reached cruising altitude, for any power setting below 33" and 2100 rpm you will be in the blue zone, which will indicate that you may move your mixture control from the AUTO RICH (green) position, back to the AUTO LEAN (blue) position to correspond with your new power settings. The manifold pressure and the rpm instruments must always match. They must both read in the blue zone or they must both read in the green zone.

This new color marking system is so obvious and so easy to follow that never again will there be any excuse for a pilot not to fly within proper power and mixture settings. This new aid makes it possible for you, at a glance, to fly within safe operating limits, but for most efficient performance, refer to your Cruise Control Chart.



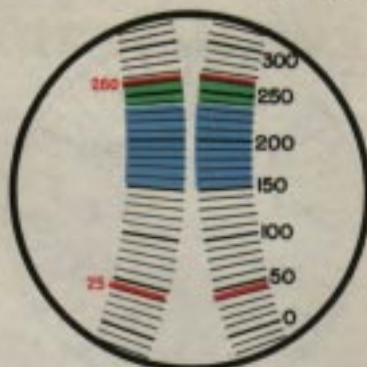
CARBURETOR TEMPERATURE



AIR SPEED INDICATOR



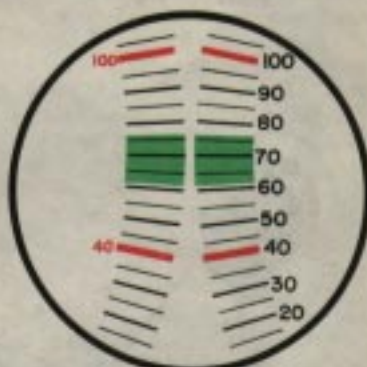
MANIFOLD PRESSURE



CYLINDER TEMPERATURE



RPM



OIL TEMPERATURE



OIL PRESSURE



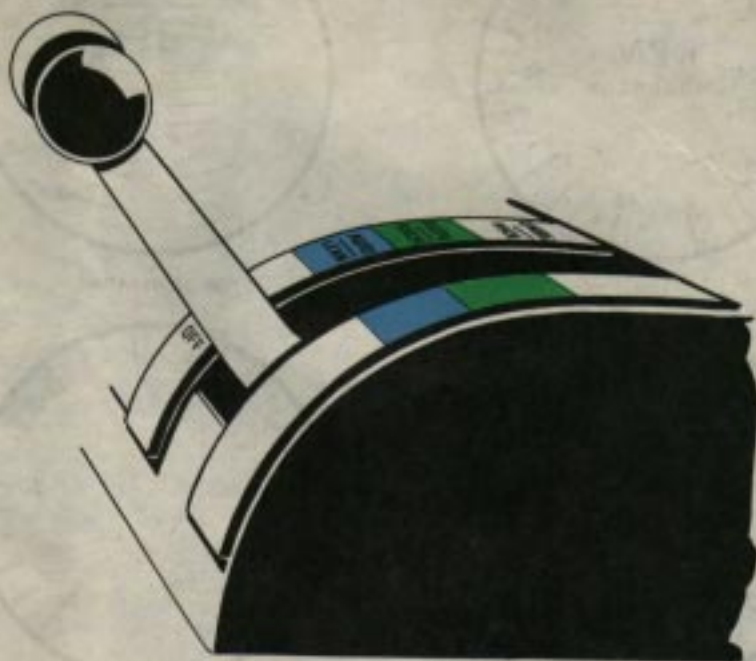
FUEL PRESSURE



HYDRAULIC SYSTEM



SUCTION



MIXTURE QUADRANT

Factors

AFFECTING OPERATION

Pre-ignition

Pre-ignition is the burning of the fuel gases within a cylinder before the sparkplug fires. It is caused by a hot spot within the cylinder, such as an overheated sparkplug, overheated exhaust valve, or a carbon deposit that continues to burn as the fresh gases are compressed.



Once pre-ignition starts it becomes progressively worse. The timing of the engine is uncontrolled; roughness and detonation follow, with resultant overheating, rapid loss of power, and possible engine failure.

Detonation

Under normal conditions the fuel charge in a cylinder burns relatively slowly. When detonation occurs, the top part of the fuel within the cylinder burns normally. This compresses the unburned part of the charge until the pressure and temperature in the cylinder rise so high that the unburned charge explodes, or detonates.



Detonation literally hammers the walls of the cylinders and causes the knock with which you are familiar in an automobile. Because of the outside noise in an airplane you can't hear the engine knock. That's why you must be on guard against detonation. You can avoid it by understanding it and following correct engine procedures.

Don't forget that detonation can cause complete engine failure during the short time that it takes you to make a takeoff run.

The indications of detonation are roughness and overheating of the engine.

These factors cause detonation—avoid them:

1. Low Grade Fuel

Do not use fuel lower than specification AN-F-27 Grade 98/130 or AN-F-28 Grade 100/130. Don't experiment. A lower grade fuel causes detonation, and engine failure results.

2. High Inlet Carburetor Air Temperatures

Use carburetor heat when known icing conditions exist. Use only enough heat to prevent icing. Check your carburetor air temperature

gage frequently to be sure that the hot air door has not opened. The yellow marking on the dial indicates caution area.

3. High Blower at Low Altitudes

Never take off in HIGH blower. Do not use HIGH blower below 9000 feet except when shifting blowers to remove sludge from clutches. The HIGH blower impeller speed greatly increases the mixture temperature as it raises the manifold pressure. The increased mixture temperature at low altitudes causes detonation.

4. Mixtures Too Lean

A too lean fuel/air ratio, particularly when aromatic fuel is used, causes detonation. Always use AUTO RICH at any power setting above 33" and 2100 rpm and for all ground operation.

5. Abnormally High Manifold Pressure

Do not use excessively high manifold pres-

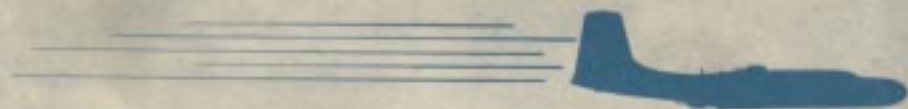
ures except when necessary, and then only with the proper rpm. Increase rpm first and manifold pressure second, in proportion. Detonation depends not only on high temperatures and pressures but also on the length of time the mixture is exposed to these temperatures and pressures.

6. High Cylinder-head Temperatures

Excessively high cylinder-head temperatures lead directly to detonation by overheating the fuel mixture as it enters the cylinder.

Effect of Altitude on Power Output

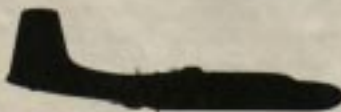
The higher you climb, the thinner the air becomes. To get the same amount of air into the engine at high altitude, you must open your throttles farther. The power output of the engine increases with altitude if you keep the manifold pressure and rpm settings constant.



10,000 FEET • 1125 HP

For Example

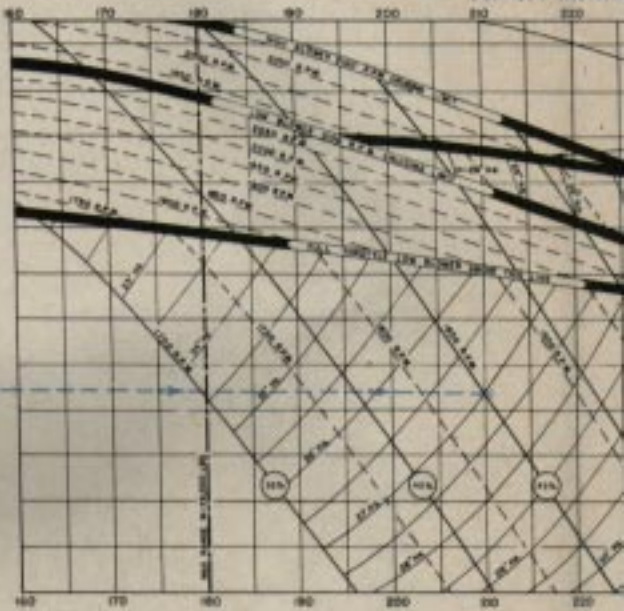
Both these airplanes are cruising at 32" Hg. and 2100 rpm. The power output of the engines at sea level is 950 Hp each. The power output of the engines at 10,000 feet is 1125 Hp each. The reason for this power increase is that the engines do not have to work so hard to push out the exhaust gases because the outside pressures at high altitudes are less.



SEA LEVEL • 950 HP

DUKAK AIRCRAFT CO. INC.
 LONG BEACH PLANT
 LONG BEACH, CALIFORNIA

CRUISING CONTROL CHART
 MODEL A-26B-NOR
 29,000 LBS. GROSS WEIGHT
 CORRECT INDICATED



EXAMPLE
 PRESSURE ALTITUDE - 5,000 FT
 O.A.T. - 27°C

THE OPERATING CONDITIONS REQUIRED TO CRUISE AT THE 5,000 CORRECT INDICATED AIRSPEED:

SOLUTION: ENTER CHART AT 27°C O.A.T. DOWN TO FOLLOW VERTICAL LINE TO 5,000 FT PRESSURE ALTITUDE POINT B; FOLLOW HORIZONTAL LINE TO 5,000 F.P.S. CORRECT INDICATED AIRSPEED POINT A FROM CHART READ 160 KIAS. 160 KIAS 17" HG MANIFOLD PRESSURE. MANIFOLD INDICATOR READING FROM APPLICABLE MANIFOLD AIRSPEED CORRECTION CHART AND, IF REQUIRED, MAKE FINAL PRESSURE ADJUSTMENT AS INSTRUCTED IN "NOTES" IS OFFERED RIGHT CORNER OF CHART.

<p>INDICATED AIRSPEED</p> <p>APPLANES WITH COLLEMAN P107-STATIC TUBE ON VERTICAL PIN 41-2800 TO 41-2900 INCL. & 43-2250 TO 43-2250 INCL. CORRECT INDICATED AIRSPEED</p> <p>AIRSPEED INDICATOR READING</p>	<p>INDICATED AIRSPEED</p> <p>APPLANES</p> <p>AIRSPEED INDICATOR READING</p>
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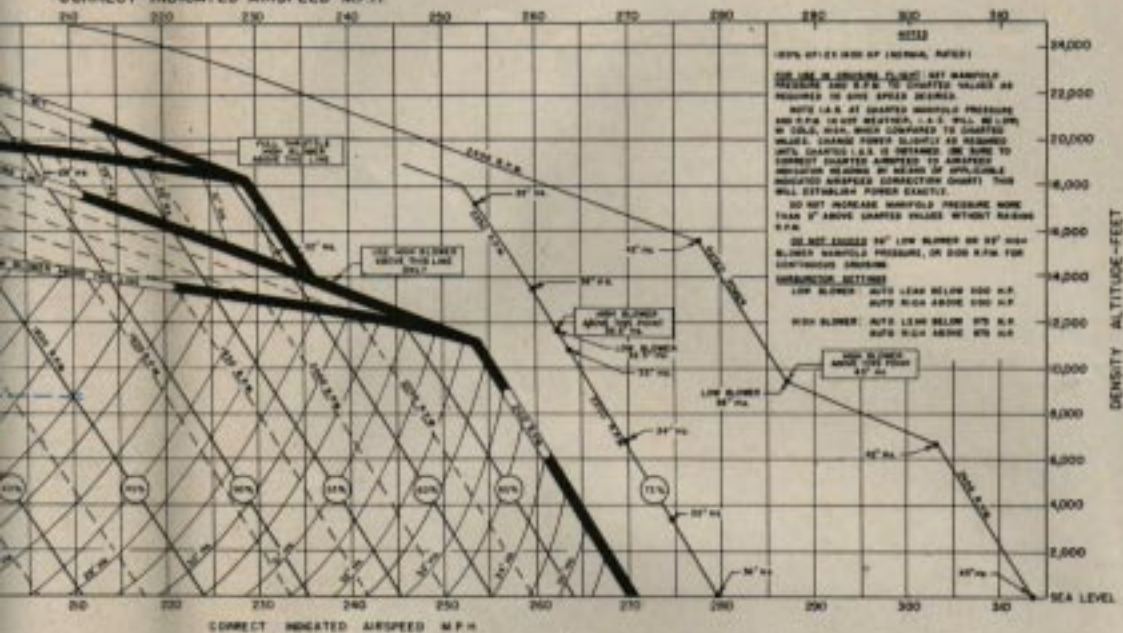
This Cruise Control Chart shows the correct manifold pressure and

You cruise your air
STUDY AND LEARN

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CRUISING CONTROL CHART

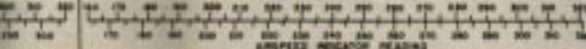
MODEL A-26B-NORMAL CONFIGURATION
29,000 LBS. GROSS WEIGHT
CORRECT INDICATED AIRSPEED MPH



INDICATED AIRSPEED CORRECTION CHARTS

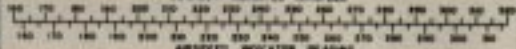
AIRPLANES WITH POWER PITOT-STATIC TUBE ON VERTICAL FIN
42-35171 TO 42-35523 INCL.
42-35524 TO 42-35550 INCL.

CORRECT INDICATED AIRSPEED



AIRPLANES WITH NOSE IMPACT AND FUSELAGE STATIC OFFICES
42-35524 & 5080
42-35551 & 5080

CORRECT INDICATED AIRSPEED



REV. 1, 1944

d pressure and rpm settings for all altitudes.

You cruise your airplane at 62.5% power during most of your training.

STUDY AND LEARN THE PROPER MANIFOLD PRESSURE AT 62.5% POWER AT ALL ALTITUDES.

BLOWER OPERATION

Your engine blowers are virtually trouble-free. Blower difficulties are caused by incorrect procedure. Observe the accompanying procedures exactly, and the important tips that follow, and you and blower trouble will remain absolute strangers.

Move both blowers together

To Change to HIGH Blower

1. Reduce manifold pressure 3".
2. Move blower controls quickly, without hesitation, to HIGH blower.
3. Check to see that the oil pressure fluctuates and that manifold pressure increases.
4. Make sure that the control handles are locked firmly in the HIGH position.
5. Adjust manifold pressures to proper settings.



To Change to LOW Blower

1. Move control handles quickly, without hesitation, to LOW blower.
2. Make sure that the oil pressure fluctuates and that the manifold pressure decreases.
3. Check to make sure that control handles are firmly locked in the LOW position.
4. Adjust manifold pressures to proper settings.

IMPORTANT TIPS

Shift the blowers from one stage to the other every 5 hours during flight to remove the sludge which forms in the blower clutches. Allow at least 5 minutes between shifts so the clutches have time to cool.

It is important to check the fluctuation of oil pressure as well as manifold pressure when you shift blowers. The oil pressure should drop and then return to normal.

Make sure that your blowers are always locked either in HIGH or LOW blower. Never leave the control lever in intermediate position.

Use a quick, definite motion to shift blowers.

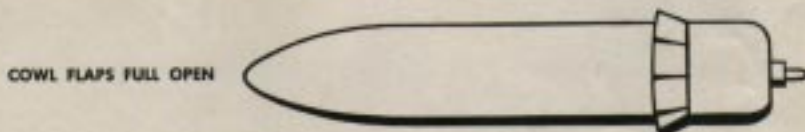
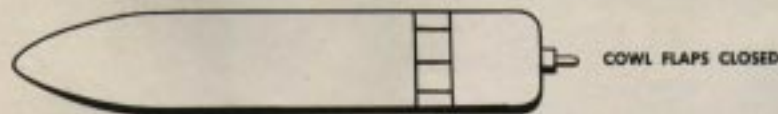
When you shift from LOW to HIGH blower remember that the increased impeller speed absorbs from 100 to 300 additional Hp from your engine and increases fuel consumption. At lower power settings it is more advantageous for you to increase your rpm up to 2100 than it is to change into HIGH blower.

Do not change to HIGH blower until you reach critical altitude. This varies according to power setting. Critical altitude is the highest altitude at which you can maintain a given manifold pressure and rpm setting with full throttle. (See Cruise Control Chart.)

Use of Cowl Flaps

There are only a few simple rules to follow:

1. Ground Operation . . . Full open
2. Takeoff One-half to full open
3. AUTO RICH Adjust to keep cylinder-head temperatures below 260°C.
4. AUTO LEAN Adjust to keep cylinder-head temperatures below 232°C.
5. Normal Cruise Adjust to keep cylinder-head temperatures approximately 200°C.
6. After Landing Always leave cowl flaps full open.



CARBURETOR ICE

There are three types of ice which form in most induction systems:

1. Impact Ice

Impact ice forms when water which existed originally as snow, sleet, or super-cooled water strikes a surface which is colder than 0°C . Impact ice occurs only when visible moisture is present and the outside air temperature is less than 15°C . If carburetor intake screens are used, they quickly become clogged by the impact ice, cutting off the airflow. If no screens are installed this ice clogs up the area around the carburetor metering elements and also chokes off the airflow. Make this a rule: **When you fly through clouds or freezing rain, keep your carburetor air temperature above 15°C .**

2. Throttle Ice

Throttle ice forms when damp air flows through a restriction (venturi tube) and is therefore quickly cooled below the freezing point. Remember that throttle ice can form even though outside temperatures are above freezing. This type of ice occurs only when the throttle butterfly valve is less than 45% open and only when visible moisture is present and the outside temperature is 5°C or less. Throttle ice accumulates rapidly, first causing the butterfly valve to stick and finally choking off air passage entirely.

To avoid throttle ice, take the following precautions:

Avoid descents through overcasts at low temperatures with throttles nearly closed.

Vary throttle settings often to prevent the throttle from sticking.

3. Fuel Evaporation Ice

Fuel evaporation ice forms when the mixture cools because of evaporation. This type of ice is unusual on the A-26 because of the design of the fuel discharge spinner ring.

Tips on All Carburetor Ice

Carburetor ice is dangerous. The best guard against it is to be on the alert and to prevent its forming by maintaining the proper temperatures. Remember, too much heat is better than not enough.

Your first indication of carburetor ice is a drop in manifold pressure. Ice can form quickly under ideal temperature and moisture conditions.



TO REMOVE ALL CARBURETOR ICE — TURN CARBURETOR HEAT TO FULL ON

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ELECTRICAL SYSTEM

The electrical system on the A-26 is efficient, reliable, and easy to understand. It's like a water pumping system. There are only three main things to consider. Source, distribution, and storage.



ELECTRICAL SYSTEM WATER SYSTEM

1. Source	Generator	Water pump
2. Distribution	Wire	Pipe
3. Storage	Battery	Storage tank

Different terms are used in an electrical system, although it functions exactly like a water system.

Pressure — Voltage

Quantity — Amperes

Resistance — Resistance (in ohms)

Water is resisted as it flows through the pipe according to the roughness or smoothness of the inside of the pipe. Electricity is resisted according to the size of the wire and the material of which it is made.

A water system has a drain-off pipe to return water to the reservoir. In an electrical system the return line consists of a ground through the airplane structure to the battery.

The A-26 electrical system is a 24-volt DC, single-wire, ground-return system. There are two generators capable of producing 200 amperes each. Thus, either generator, working separately, provides enough current to operate all the electrical equipment in the airplane and to charge the 24-volt storage battery.

Because there are two generators in the system, each has a voltage regulator to make certain that it is absorbing its portion of the load. These regulators are set at 28.5 volts and are

fastened to the floor on the right-hand side of the pilot's compartment.

There is another automatic device in this system. It is called a reverse-current relay and is simply an electric counterpart of a check valve in a fluid system. It allows the current to flow from the generator to the main bus bar (where the current is distributed) but does not allow it to flow backward toward the generator. Thus, if one generator quits, it is automatically cut out of the system and the other generator provides enough power (200 amps) to operate the electrical system.

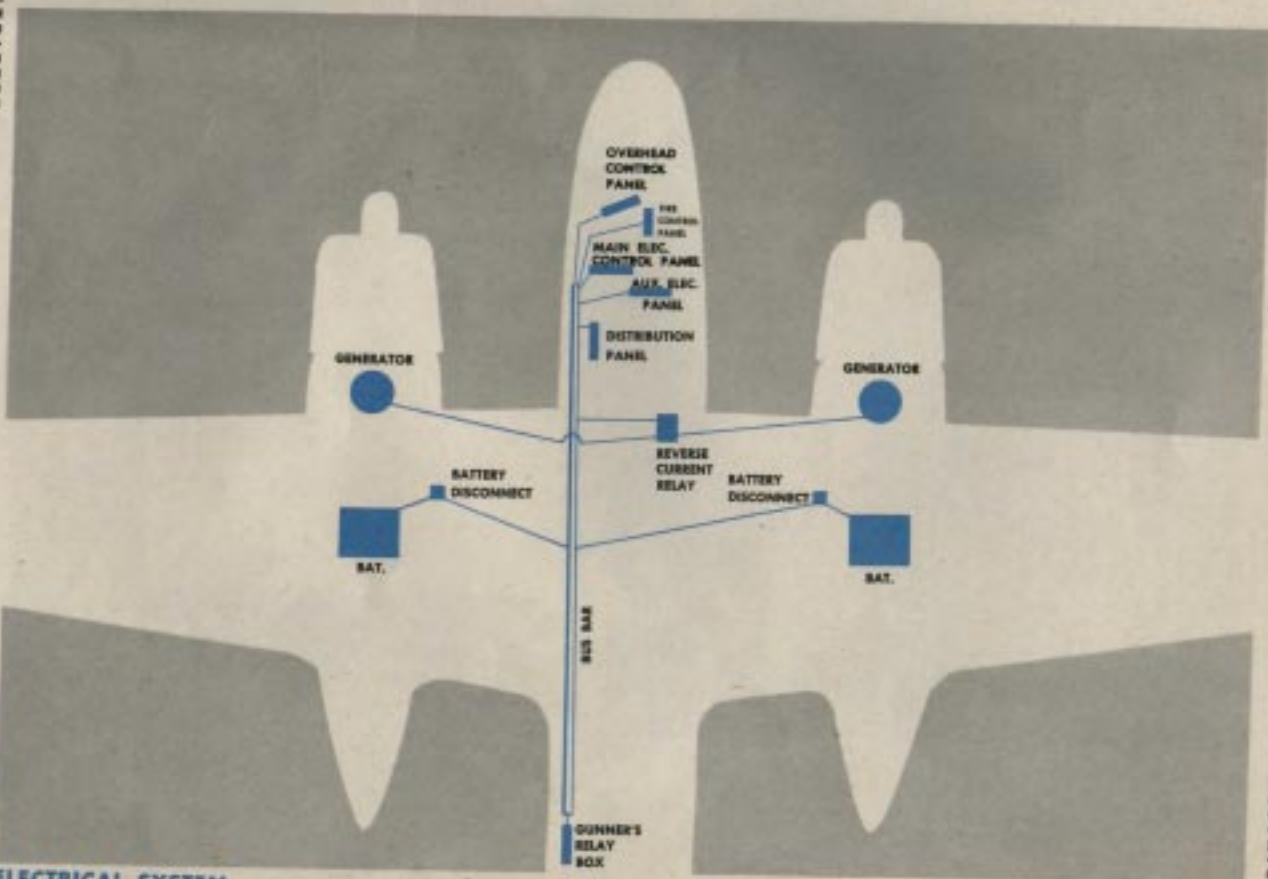
Bus Bar

The bus bar is the pipeline of an electrical system. The bus bar in the A-26 extends along the left side of the fuselage and has branches that run along the leading edge of each wing. There are as many connections to the bus bar as there are electrically operated parts.

Batteries

The batteries are the storage tanks, or reserve sources of power, used for starting the engines and operating the system when the generators are not functioning. They receive their current from the generators and maintain a full charge.

RESTRICTED



ELECTRICAL SYSTEM

RESTRICTED

FIVE CONTROL PANELS



ON SOME AIRPLANES



Main Electrical Control Panel

This is the main electrical control panel. It is in front of the control column and below the instrument panel.

ON OTHER AIRPLANES

Auxiliary Control Panel

This is the auxiliary electrical control panel. It is to the right of the main control panel.

**Overhead Control Panel**

This is the overhead electrical control panel. It is directly over the pilot's head.

**Fire Control Panel**

This is the fire control panel. It is on the center line of the airplane, just aft of the windshield.

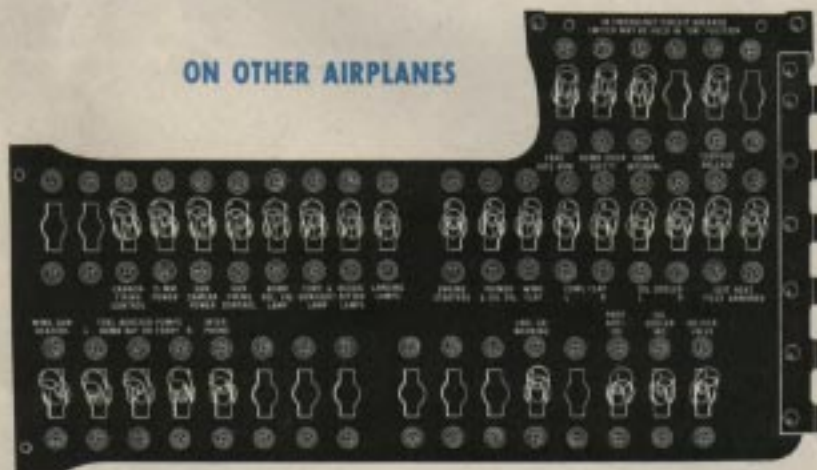
Memorize these panels. Every switch on them is important, and you must pass a blindfold test, naming each switch by touch.



DISTRIBUTION PANEL ON SOME AIRPLANES



ON OTHER AIRPLANES



Distribution Panel

This panel has a series of circuit breaker switches, or electrical pop-off valves, designed to protect the circuit when the current load exceeds the capacity of the wires. These circuit breakers may be re-set, but they pop open or remain open until the circuit is repaired.

A voltmeter and two ammeters are in the extreme lower right corner of the instrument panel. The voltmeter registers pressure—the pressure that the generator is producing. Check this voltage with both engines operating at 1700 rpm, and with both generator switches off, for a reading under no-load conditions.

The ammeter indicates the load on the system, and it also must be checked with both engines operating at 1700 rpm. It measures the load in amperes.

When you check the two generators to make sure they are carrying an equal amount of load, they should not differ more than 20 amperes. The voltage must be within .5 volts of being equal.

Besides the re-set switches you can reach in flight, there are two more places where you can locate electrical trouble on the ground. The forward electrical junction box is forward of the instrument panel and contains manual re-set circuit protectors.

Gunner's Relay Box

Also, there is a gunner's relay box which contains nine more manual re-set circuit protectors.

Manual re-set circuit protectors differ from circuit breakers because they are literally fuses and burn out and have to be replaced if they are held in the ON position.



**BE SURE YOUR GUNNER THOROUGHLY
UNDERSTANDS THIS**

HYDRAULIC SYSTEM

The A-26 hydraulic system performs three functions:

1. It extends and retracts the wheels.
2. It opens and closes the bomb bay doors.
3. It operates the brakes.

Pumps

There are two engine-driven pumps, one in the accessory section of each engine. They are gear-type, positive pumps of simple design and are virtually trouble-free. One pump alone produces sufficient power to operate the hydraulic system. Thus, single engine flight does not mean hydraulic emergency. However, one pump alone requires more time to operate the hydraulic system.

Pressure Accumulator

The pressure accumulator carries continual pressure of 1000 psi (+ or -20). It is a spherical, welded steel container divided by a synthetic rubber bladder, carrying air pressure on one side and hydraulic pressure on the other.



On the air pressure side there is an initial pressure of between 600 and 750 psi. This air section functions as a cushion to absorb fluid surges in the hydraulic system and to aid in maintaining constant pressure in the system.

Pressure Regulator

The pressure regulator is an automatic device controlling the amount of pressure maintained in the accumulator. When the pressure reaches 1000 (+ or -20) the regulator bypasses the fluid to the hydraulic reservoir. As the system operates, the pressure in the accumulator is expended and when it reaches 850 (+ or -20) the bypass valve closes and the pumps again build up accumulator pressure to 1000 psi.

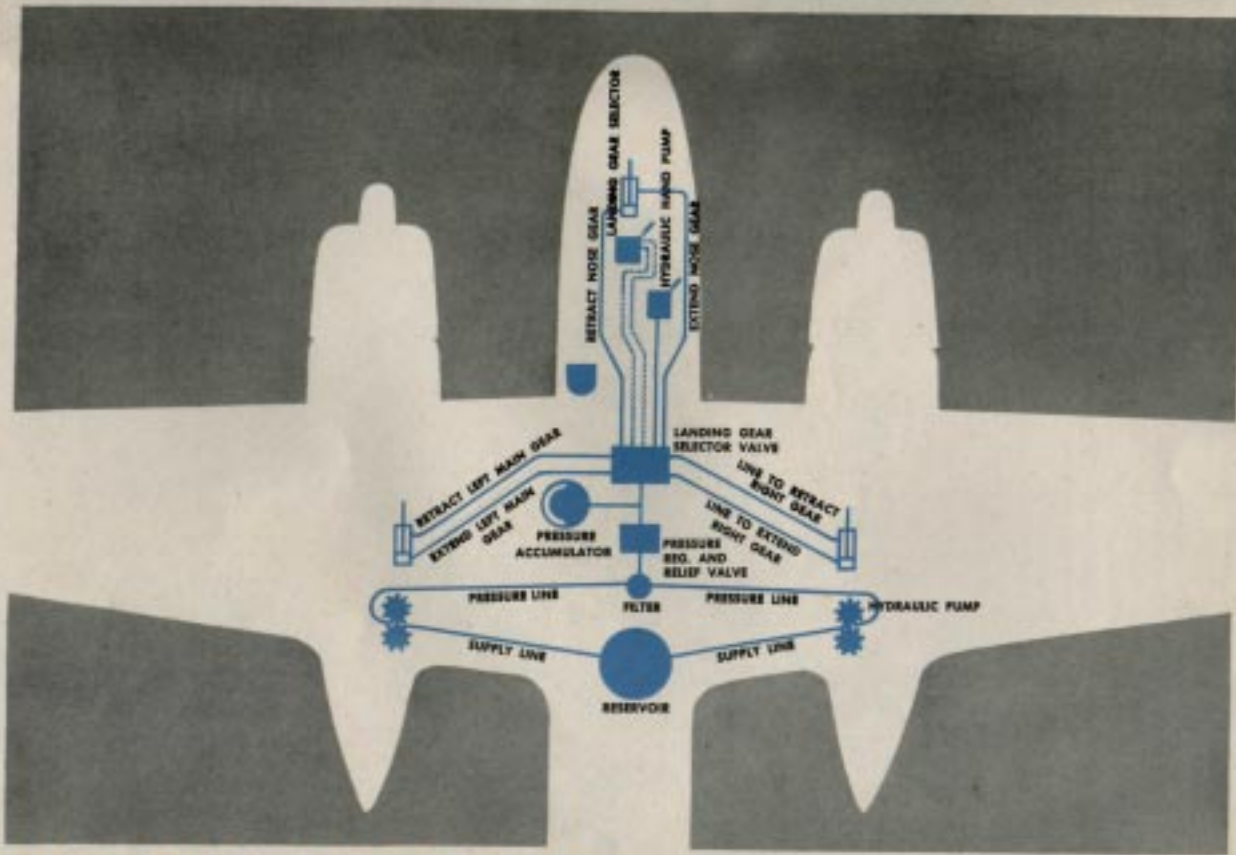
Main Hydraulic Reservoir

This welded aluminum container is in the rear of the pilot's compartment just behind the gun loader's seat. Its capacity is 1 $\frac{3}{4}$ U.S. gallons. It supplies fluid to the main system and also to the auxiliary reservoir. A glass sight gage showing fluid level is built into the main reservoir.

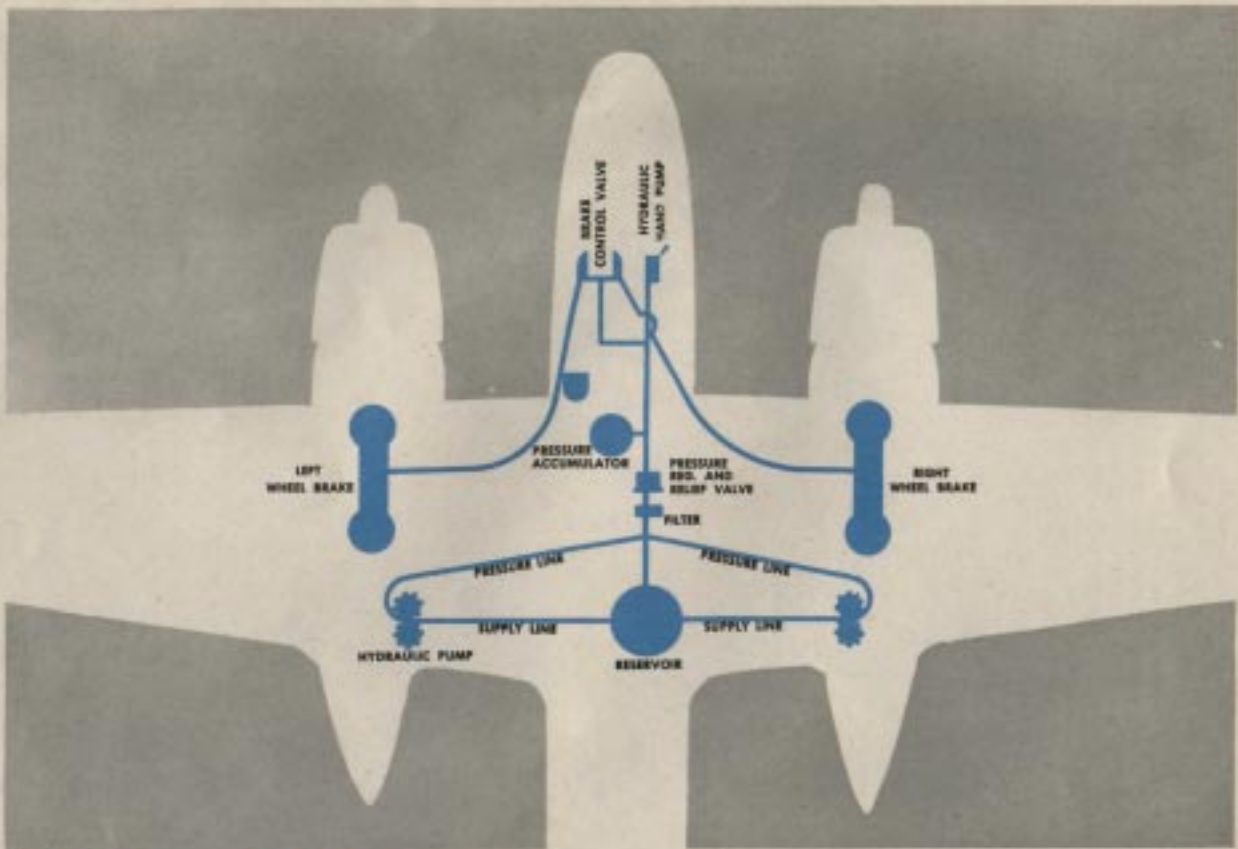
Filter

A Purolator unit, to filter the hydraulic fluid in the main system, is at the right of the main hydraulic reservoir on the pressure line between the pumps and the pressure regulator.

Study the simple diagrams on the following pages. Know them thoroughly. Most hydraulic emergencies are not emergencies at all, but merely the result of the pilot's faulty knowledge of the hydraulic system.

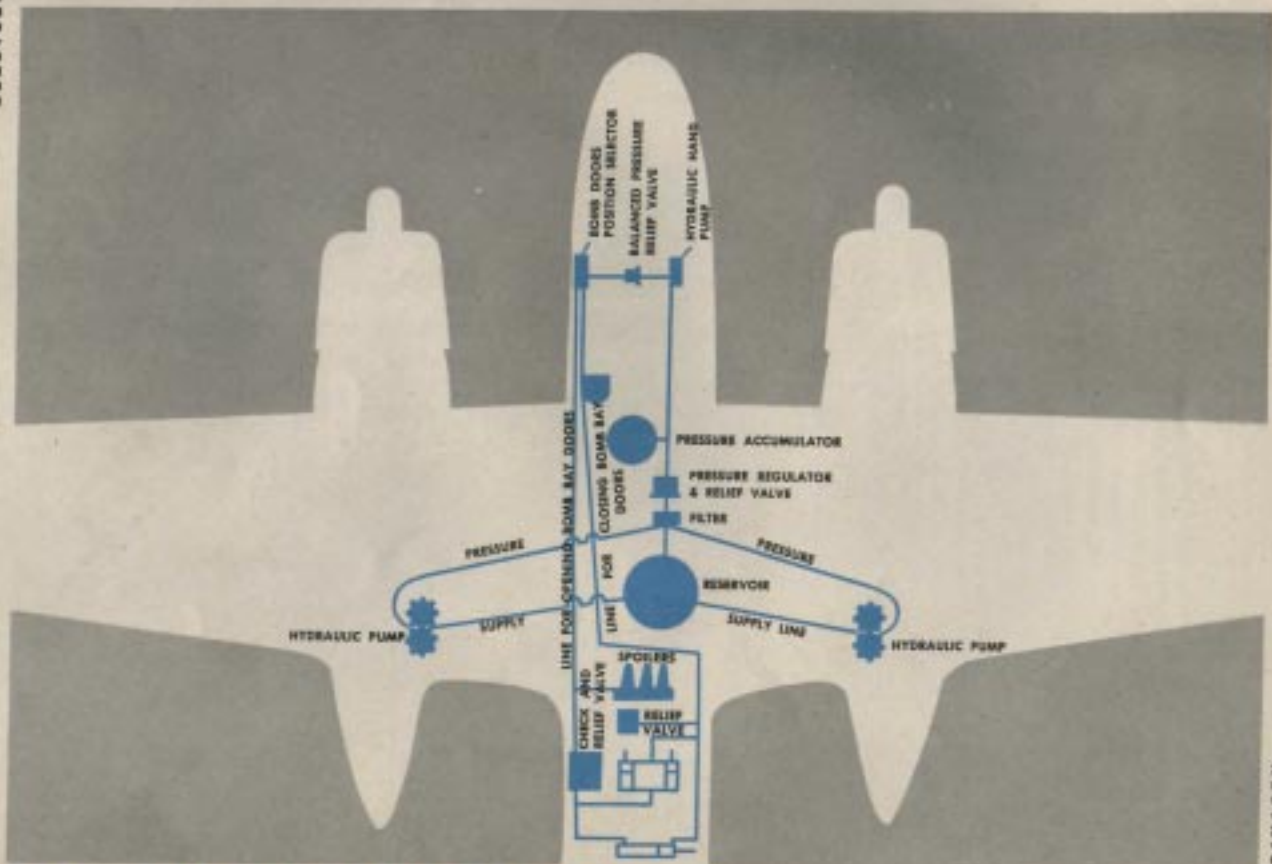


HYDRAULIC SYSTEM FOR OPERATING LANDING GEAR



HYDRAULIC SYSTEM FOR BRAKES

RESTRICTED



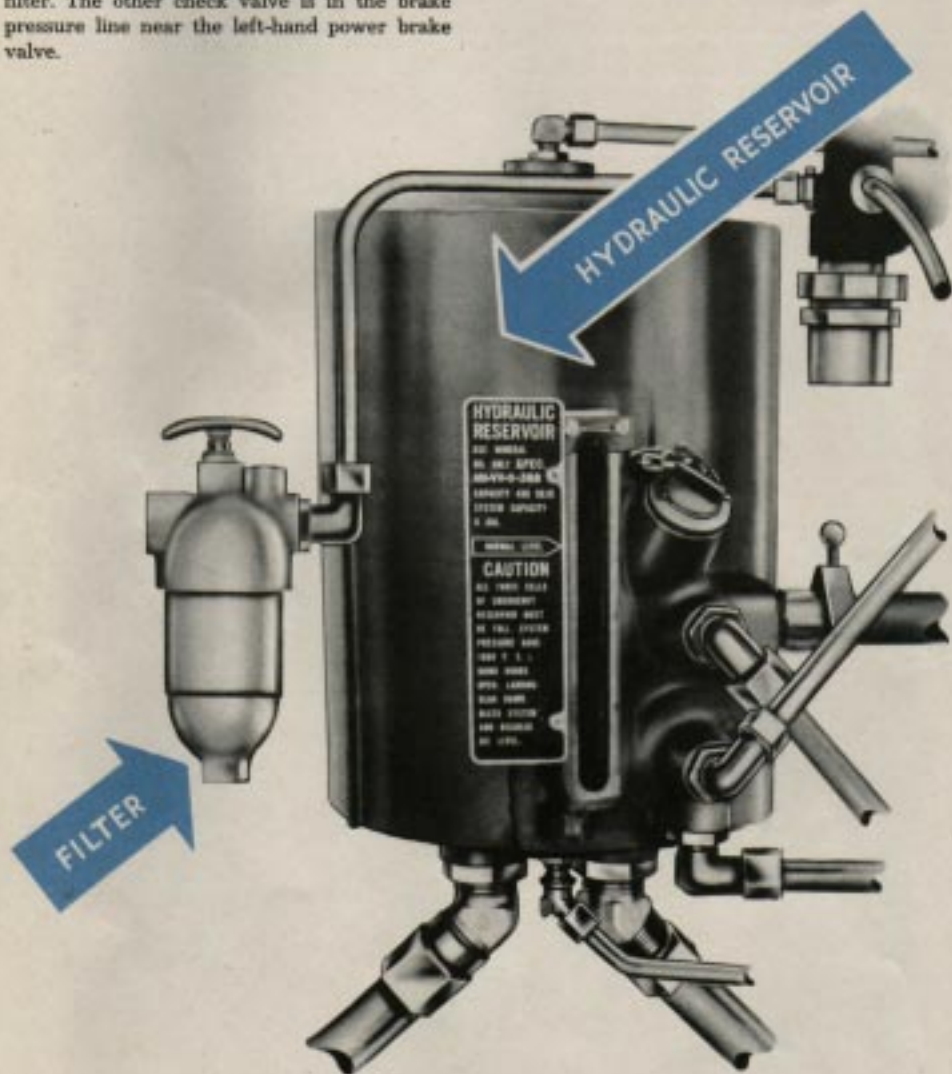
35 HYDRAULIC SYSTEM FOR OPERATING BOMB BAY DOORS

RESTRICTED

RESTRICTED

Check Valves

Three check valves operate as traffic cops of the hydraulic system and permit the flow of fluid in one direction only. Two of these valves are in the pressure lines (one in each line) where the two lines connect at the Purolator filter. The other check valve is in the brake pressure line near the left-hand power brake valve.



MAIN LANDING GEAR



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The wheels of the main landing gear of the A-26 extend against and retract with the slipstream. This is why you must pay strict attention to the airspeed limitations for lowering the gear.

Select the position of your gear with the lever mounted on the pedestal. The lever controls a selector valve that has four openings: one for the pressure supply line to the valve, one for the line that goes to the side of the actuating cylinder that retracts your gear, one for the line that goes to the side of the actuating cylinder that extends the gear, and one to return the fluid to the reservoir.

The lever has only three positions. The UP position retracts the gear, the DOWN position extends the gear, and the neutral position merely closes all four ports of the valve, thus reducing the amount of line under pressure.

The main gear doors operate mechanically by direct linkage to the main gear strut. A spring-loaded mechanical latch locks against a stop on the retracting link. This same latch secures the landing gear in the UP or DOWN position.



NOSE GEAR

One motion of the gear lever operates both the nose and main gear. The nosewheel doors operate hydraulically by a separate actuating cylinder. A mechanical latch prevents the nose gear from extending until the doors are open. It also prevents the doors from closing until the gear is completely retracted. A plunger type latch locks the nose gear in place when it is fully extended.

Important Landing Gear Tips

The No. 1 rule that you must always observe is: Do not attempt to operate your gear until your airspeed has dropped to 160 mph or less. Your nose gear does not extend at higher speeds, and you may cause damage by attempting it.

Automatic Safety Device

There is a release switch on the left main shock strut. While there is weight on this strut, depressing it, a steel pin prevents the gear handle from being moved to the UP position. On takeoff, when the weight is removed from

the wheels, a solenoid retracts the pin, allowing the gear handle to be moved to the UP position. Always keep the gear handle in the DOWN position while the airplane is on the ground.

Solenoid Failure

If this solenoid fails, the pin stays in place, preventing the gear handle from being moved to the UP position. If this happens, reach back over your right shoulder, depress the solenoid pin, and at the same time move the sickle-shaped handle next to the pin to the UP position.

Indicator

A wheel position indicator on the instrument panel shows the position of the gear at all times. In addition to this indicator, there are two warning lights, red and green. The red light burns when the gear is in unsafe position; the green light burns when the gear is DOWN and locked. Check the operation of this warning light before every landing with a test switch on the left side of the instrument panel. Your red warning light burns when the throttles are retarded if the gear is up and locked.



DON'T LOWER LANDING GEAR

UNTIL AIRSPEED HAS DROPPED TO 160 MPH OR LESS

Hydraulic Brake System

The A-26 power brake system consists of a separate braking action for each wheel with two brake units of the multiple-disc type in each main landing wheel. Although they are power brakes, the amount of braking action is directly proportional to the force you apply to the brake pedals. Use your brakes carefully. Your brakes are like money in the bank. Be thrifty, so that when you need all you've got, you'll have all you need.

Parking Brake

You operate the conventional parking brake by depressing the rudder brake pedals fully and by pulling back the parking brake lever on the left side of the pilot's compartment.



To operate:

1. Depress brake pedals.
2. Pull parking brake lever back and hold.
3. Release foot pedals.
4. Release parking brake lever.

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Bomb Bay Door System

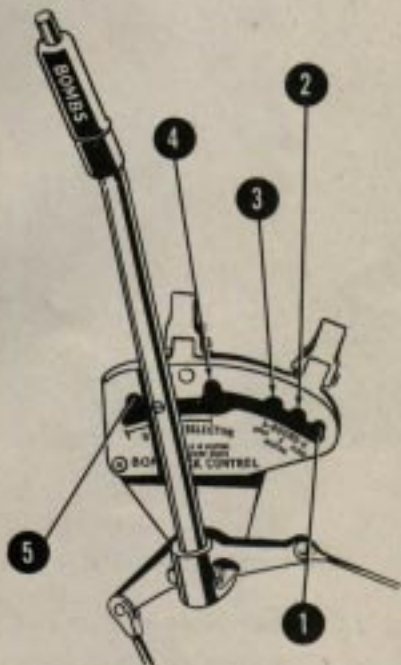
The operation of the bomb bay doors is similar to that of the wheel system. There is a 4-way selector valve with two lines running to each of the two forward and one aft bomb bay actuating cylinders.

On later series, bomb bay door spoilers are used to allow doors to be opened at high speeds. These spoilers operate automatically by a separate actuating cylinder.

Bomb Bay Control Lever

A control lever next to the pilot's left knee operates the bomb bay doors. The lever has five positions:

1. CLOSED
2. NEUTRAL
3. OPEN
4. SELECT (this is used when entering the bomb run and does not concern the hydraulic system).
5. SALVO



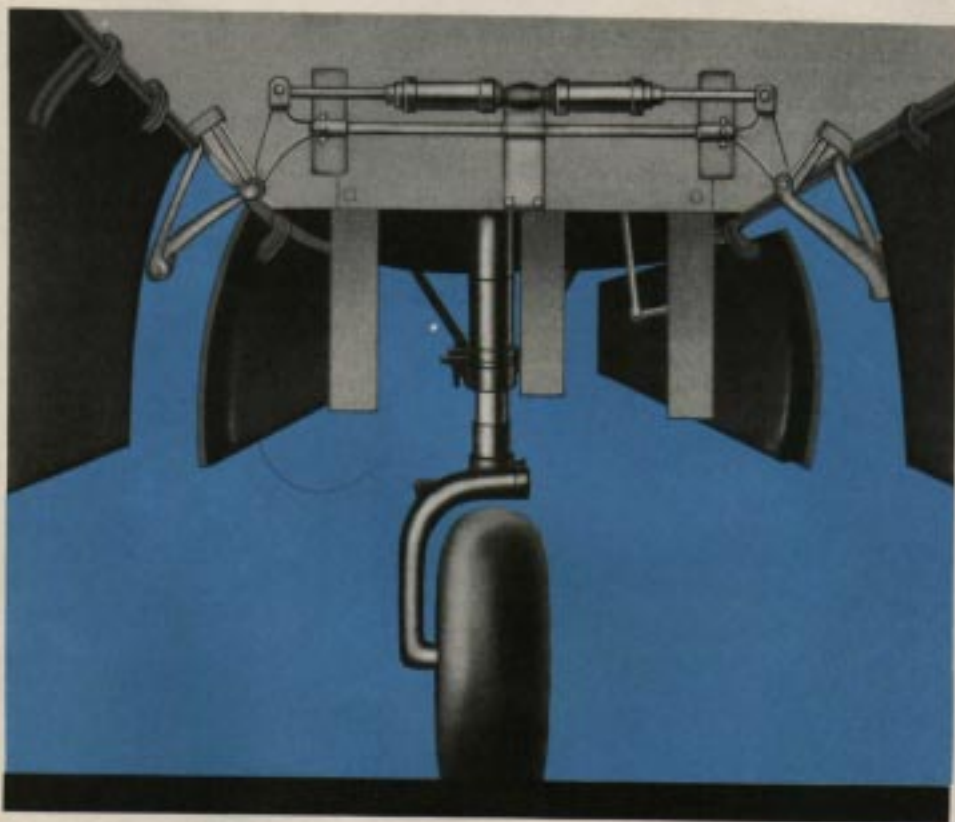
RESTRICTED

On later series an electric toggle switch replaces the control lever. It is on the instrument panel directly in front of the pilot.

The bomb bay doors on earlier series can be locked in the CLOSED position by two solenoid switches, one forward and one aft in the

bomb bay. The doors cannot be opened when these switches are on, so crew members can walk safely through the bomb bay in flight.

The hydraulic bomb bay door system is trouble-free if you observe the proper procedure and airspeed limitations.



IF THE AIRPLANE HAS BOMB BAY DOOR SPOILERS, YOU CAN OPEN THE DOORS AT HIGH SPEEDS UP TO RED-LINE AIRSPEED LIMITS.

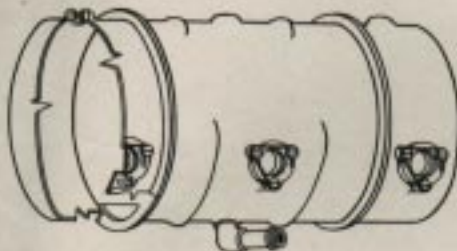
IF THE AIRPLANE DOES NOT HAVE SPOILERS, DO NOT OPEN THE BOMB BAY DOORS UNLESS YOUR AIRSPEED IS 240 MPH OR LESS.

EMERGENCY HYDRAULIC SYSTEM

There is an emergency hydraulic system to use in case of failure of the main hydraulic system. This system operates only the landing gear and the bomb bay doors. There is no emergency hydraulic system for braking action. Instead, there is an air bottle emergency brake.

Emergency Fluid Reservoir

Your emergency reservoir is divided into three separate cells, each with a bull's-eye inspection window. All three cells are filled by gravity from the main reservoir, and although you may lose the fluid in your main reservoir, you still have ample hydraulic fluid in the three



emergency cells for at least one emergency operation of each unit. One cell is to extend the landing gear, one to open the bomb bay doors, and one to close the bomb bay doors. In this system there is a double-acting, piston-type hand pump which you use to supply fluid either to the main system (when the engine-driven hydraulic pumps fail), or to the emergency hydraulic system. The emergency selector valve directs the fluid from the hand pump through the emergency lines to the equipment to be operated.

Although there are separate emergency pressure lines, the fluid returns from each operation through the main return lines. Therefore, you must set the corresponding main hydraulic selector control for the desired operation, as well as the emergency selector valve. When you

complete the operation, always return the emergency selector handle to SYSTEM.

Bleeding the System

The hydraulic pressure reading is taken from the pressure line between the accumulator and the brake assembly valve. The phrase "bleeding the hydraulic system," as used here, means to obtain a reading of zero on the gage.

There are three reasons for bleeding the hydraulic system:

1. **To get an accurate reading on the hydraulic reservoir:** With bomb bay doors open, bleed the system by operating the brakes until you obtain a zero reading on the hydraulic pressure gage. This removes all the fluid from the accumulator and returns it to the reservoir.

Always bleed the system and check the hydraulic reservoir before starting engines.

2. **To remove air trapped in the lines:** Air in the lines causes faulty operation. If several operations do not remove the trapped air in your brake lines, have your crew chief drain the brake system.

3. **To check air pre-load in the accumulator:** After bleeding the system, use the hand pump to build the pressure up until the pump action is stiff. The reading of the hydraulic pressure indicates the air pre-load in the accumulator. Four full strokes should build up 650 psi.

EMERGENCY HYDR. SELECTOR VALVE

CAUTION

MAIN SELECT VALVE MUST BE IN CORRECT POSITION
KEEP HANDLE AT "SYSTEM" EXCEPT IN EMERGENCY
WHEN MOVING HANDLE FROM "B. D. OPEN" TO
"B. D. CLOSED" STOP AT "SYSTEM" FOR APPROX. 5 SEC.



FUEL SYSTEM

On the opposite page is a simplified drawing of the A-26 fuel system. It includes five self-sealing tanks: two main tanks, two auxiliary tanks, and a bomb bay tank. The main tanks hold 300 gallons each and are in the nacelles about 3½ feet behind the engines.

Two auxiliary tanks, of 100 gallons each, are in the wings between the nacelle and the fuselage. The bomb bay tank, holding 125 gallons, is installed in the forward bomb bay. The bomb bay tank is removable but cannot be salvaged. Fully fueled, you have a total of 925 gallons. At 62.5% power, this gives you 6+ hours in the air. (See Cruise Control Chart for other fuel-power settings.)

In addition to the five tanks, a ferry tank can be installed in the bomb bay. This tank is not self-sealing and is used for ferrying purposes only. It holds an additional 675 gallons.

Fuel Gages

These gages are on the right side of the instrument panel. A float arm in each tank registers, through an electrical transmitter, the quantity on the fuel gage.

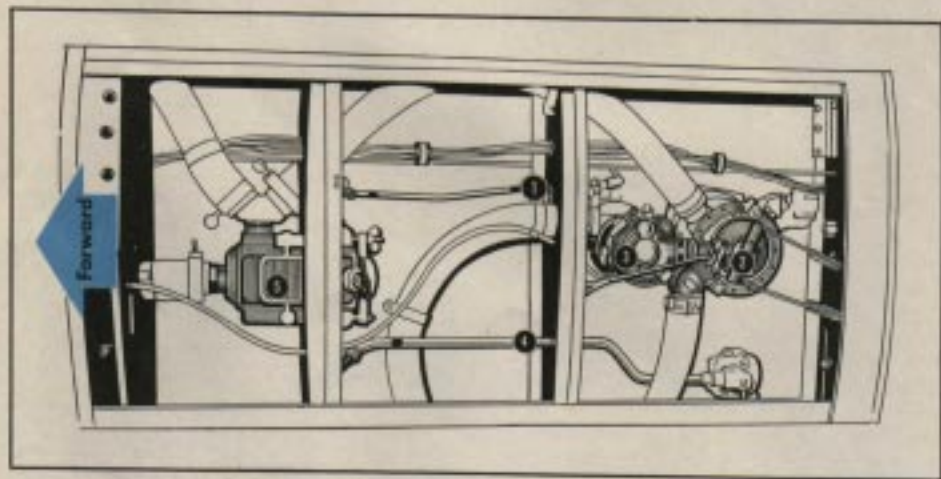
Fuel Pressure Gage

A fuel pressure gage on the instrument panel indicates the fuel pressure to the carburetor.

Booster Pumps

A 2-speed electric booster pump is installed in each of the five tanks. Use low boost for starting the engines. Low boost gives you 7 to 9 lbs. pressure to the carburetor. Use high boost (pressure of 15 to 22 lbs.) for:

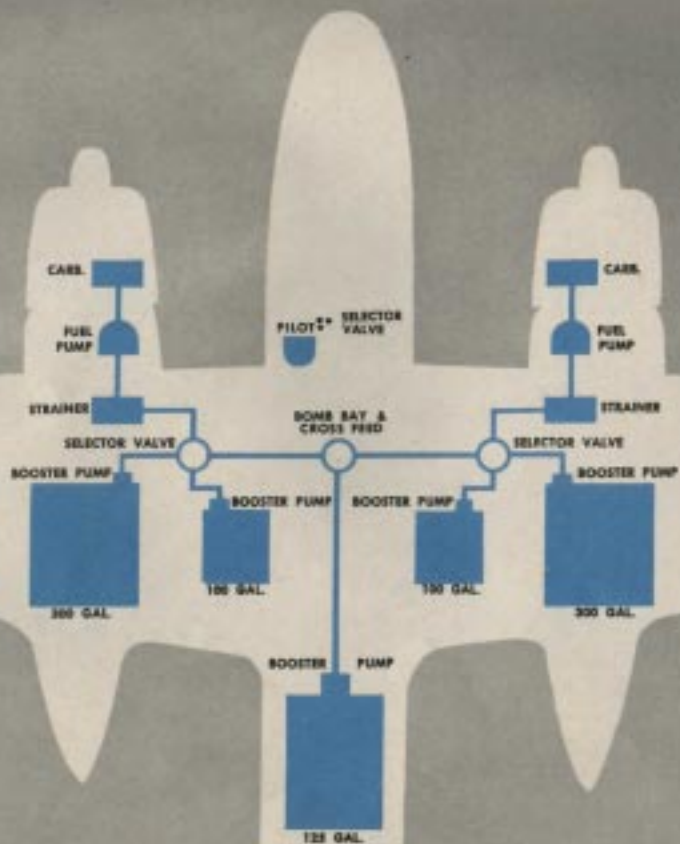
1. Takeoff.
2. Landing.
3. High-altitude flight.
4. When the engine pump fails to supply fuel to the carburetor.



RIGHT HAND NACELLE FUEL TANK LOOKING UP

- | | |
|---------------------------------|------------------------------|
| 1 Booster Pump Drain Line | 4 Drain Line (Residual Fuel) |
| 2 Fuel Container Selector Valve | 5 Fuel Strainer |
| 3 Booster Pump | |

RESTRICTED



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Booster Pump Switches

Three switches on the pilot's control pedestal, just forward of the prop controls, operate the five booster pumps. The middle switch operates the bomb bay booster pump. The switch on the right operates the booster pump on either the right main or the right auxiliary tank, depending on your selector valve settings.

For example: When you use fuel from the right main tank, turn on the right booster pump. When you change to right auxiliary, merely change your fuel selector valve and it automatically turns off the right main booster and turns on the right auxiliary booster. The switch on the left operates booster pumps on left main and auxiliary tanks in the same way.

Fuel Flow

From the five booster pumps the fuel passes to the selector valves, which are at the bottom of the nacelles. The selector controls which actuate these valves by means of cable linkage are at the right of the pilot's seat.

There are three positions on each of the two selector controls: one for main, one for auxiliary tanks, and a third position for OFF, which you use when not taking fuel from these tanks.

From the selector valve the fuel flows into a fuel strainer, and from there into the carburetor.

Bomb Bay Selector Valve and Crossfeed

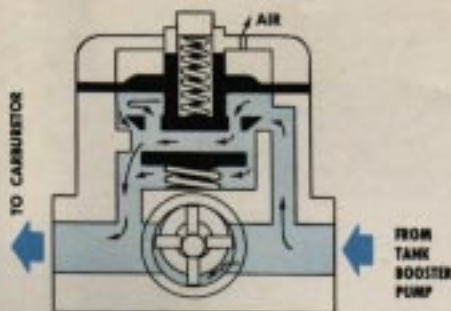
The lines from the bomb bay selector valve and crossfeed also join the fuel system at the inlet side of the strainer. This valve is aft of the main selector controls.

The bomb bay selector valve and crossfeed can be set in eight positions, but only four of these allow fuel flow through the unit. The other four are merely OFF positions.

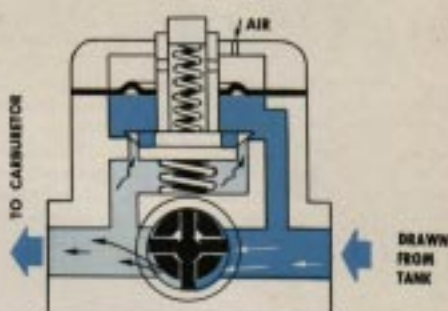
Keep in mind that the source from which the fuel is coming is the bomb bay tank, and the selection of R.H. ENG. means the fuel is being directed to the right-hand engine, L.H. ENG. to the left-hand engine, and BOTH ENGS. to both engines. The ON CROSSFEED position of this valve is an entirely different operation that cuts out any fuel flow from the bomb bay tank and acts only as a connecting line for transfer of fuel from the tanks on one side of the airplane to the engine on the opposite side.

Fuel should not be directed from one tank into another because of the danger of vapor lock and possible loss of pressure to the operating engine.

**SELECTOR VALVES**



FUEL UNDER PRESSURE FROM BOOSTER PUMP BY-PASSES INOPERATIVE ENGINE-DRIVEN PUMP



FUEL DRAWN BY ENGINE-DRIVEN PUMP OPERATION AND DELIVERED AT LESS THAN MAXIMUM PRESSURE

ENGINE-DRIVEN FUEL PUMP OPERATION

Strainer Unit

The fuel flow from all tanks passes through a strainer unit to the engine-driven pumps. The strainer is a simple screen type, with a removable screen for cleaning. It includes a drain-cock for draining the lines to the carburetor or from the selector valves. This must be done on preflight to eliminate water.

Engine-driven Fuel Pumps

The engine-driven fuel pumps are rotary positive-displacement types. Each contains a relief valve in the top of the pump housing which regulates the pressure to the carburetor.

There is also a bypass valve in the top of the pump housing which permits the fuel to be bypassed around the pump to the carburetor in case of fuel pump failure.

The booster pumps provide the pressure to supply fuel to the carburetor if the engine-driven pumps are not operating.

Carburetor

The carburetor is a diaphragm, pressure-injection type. The fuel flows to the carburetor and is there metered to the impeller section by metering jets. These metering jets are controlled by air pressure, regulated by the throttle unit.

A fuel head enrichment jet gives you a rich mixture at high power for the purpose of cool-

ing the engines. An idling metering jet provides proper mixture at idling speeds.

Mixture Control

An automatic mixture control in the carburetor gives constant mixture at any altitude within operating limits.

FULL RICH on the mixture control handle cuts out automatic mixture control. It is safetied so that you cannot use it except in emergency. Use AUTO RICH when operating above 62.5% power and AUTO LEAN at 62.5% power or less. These mixture controls are at the right side of the pilot's pedestal.

Do not pull mixture controls back farther than AUTO LEAN in an attempt to obtain a leaner mixture.

Priming

There is a priming solenoid on each carburetor. The spring-loaded switches operating these primers are directly over the pilot's seat and should be used only when boosters are on. Depressing these switches allows the fuel to flow through small primer lines to the top eight cylinders.

There is also an overflow line from the carburetor back to the main tanks which permits the fuel that cannot be consumed by the carburetor to return to the system.

OIL SYSTEM

The A-26 has identical independent oil systems to lubricate and cool the engines. The accompanying illustration shows the cycle completed by the oil in the system. It is pumped from the hopper tank in the oil container through the engine. From there it flows back to the oil temperature regulator, which adjusts the temperature, returning to the hopper tank in the oil container.

Oil Tank

A self-sealing oil tank, incased in an aluminum alloy shell, is in each of the nacelles just

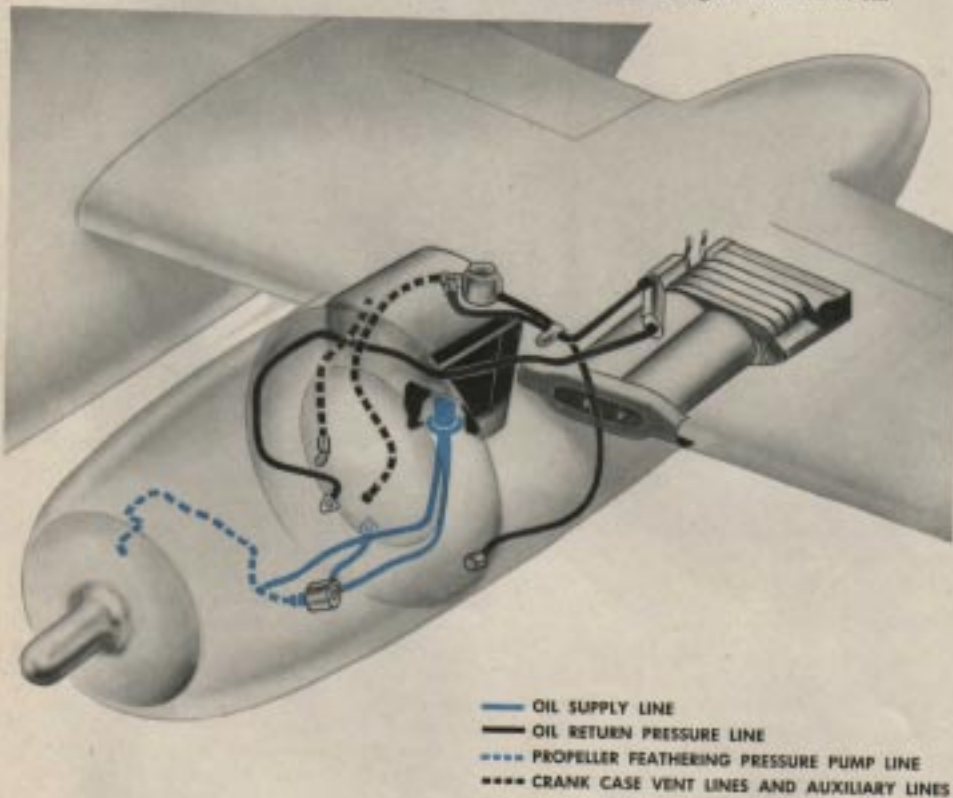
behind the firewall. Each oil tank has a capacity of 30 gallons at the FULL mark. Maximum capacity is 34.5 gallons. Even though engine oil pressure drops to zero 1.5 gallons still are retained by a standpipe within the tank for emergency feathering of the propeller. There is expansion space of 4.5 gallons in each tank to allow for normal expansion or oil dilution in cold weather operation. The oil level of the tanks is measured with the dip sticks.

Hopper Tank

The hopper tank is a tube 6 inches in diameter that stands in each oil tank. It is perforated at the top and bottom.

The hopper tank is designed to:

1. Furnish the engine with warm oil.



2. Warm the surrounding bulk oil.
3. Limit the amount of oil diluted during cold weather operation.

Oil Temperature Regulator

The automatic temperature regulator receives the oil after it has passed through the engine and accessory group, and determines whether the oil is to be cooled or heated before returning it to the hopper tank. This regulator cools oil by directing its flow to the oil radiators. If the oil is too cold, it bypasses it around the radiator and through an oil heater. The oil temperature regulator is in the leading edge of the wing, just outboard of the engine nacelle.

Oil Cooler Doors

The oil cooler doors are controlled by a switch in the cockpit. You use them to aid the automatic oil temperature regulator in maintaining proper oil temperatures.

Y Oil Drain Valve

The Y oil drain valve drains the entire oil system with the exception of 1.5 gallons which remain below the standpipe level. The Y valve has an inlet connecting with the oil dilution valve.

Oil Dilution Solenoid Valve

For cold weather starting there is an oil dilution system. Fuel drawn directly from the fuel pressure line enters the system at the Y oil drain valve. The only purpose of oil dilution is to thin the oil for cold weather operation.

Step-by-step instructions on this are given in "Cold Weather Operations."

The purpose of an exact procedure is to make certain that the oil is diluted as little as necessary and that the diluted oil is distributed throughout the system. For example: It is extremely important for the diluted oil to enter the propeller domes to insure proper increase-decrease operation in cold weather.

Oil Temperature and Pressure Gages

The oil temperature and pressure gages are highly important, as they may be your only warning before you lose an engine.

The oil temperature bulb is connected to the bottom of the sump, and records the temperature of the oil just before it enters the engine. The oil pressure reading is taken where the oil enters the engine under greatest pressure.

Engine Pump

An engine-driven, gear-type pump supplies oil to the engine. The oil passes through a screen before it enters the pump.

Important Tips About the Oil System

1. Always check your pressure and temperature gages in relation to each other.
2. Listen to your props. If one tends to overspeed, it may be your first indication of oil system failure, quickly followed by engine failure.
3. Check your pressure gage frequently for oscillation. If the needle begins to fluctuate you may be close to engine failure. In any case, land and determine the trouble.



Watch these instruments

PROPELLERS

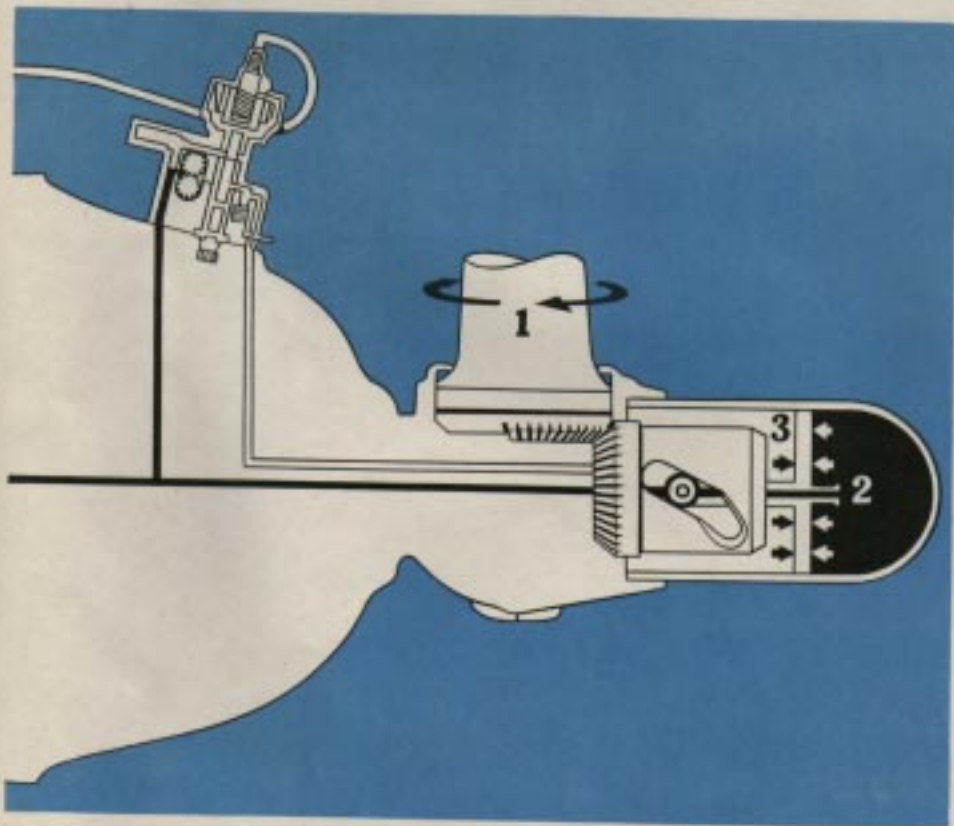
The A-26 has Hamilton Standard hydromatic propellers. They are 3-bladed, constant-speed, full-feathering propellers with a diameter of 12 feet 7 inches. There are three fundamental forces affecting the operation of these propellers. If you understand these forces and the mechanism that controls them, you know all you need to know about your propellers.

First Force is a twisting movement that takes place when the rotating blades turn toward the least wind resisting angle. This is high rpm and causes the piston in the propeller dome to be pushed to the back side of the dome. The

blade angle depends entirely upon the position of the piston in the dome.

Second Force is the engine oil pressure that is conducted from the engine to the forward side of the piston through the hollow piston shaft. This force aids the first force in pushing the piston toward the back of the dome. The piston turns the blades toward high rpm by a cam and gear assembly.

Third Force is supplied by a special engine-driven pump. You regulate the pressure from this pump in the cockpit by the prop controls. Therefore, the prop is held at a constant speed by balancing the first two forces from the forward side of the piston by an equal amount of force on the back side of the piston.





FEATHERING PROPELLER



The feathering device on this propeller has an electric pump which you start by pressing the red feathering button on the control pedestal in the cockpit. It takes oil from the engine oil tank and forces it, under extremely high pressure, to the prop governor housing. This high pressure in the housing actuates a transfer valve which disconnects the prop governor from the system and allows the high-pressure oil to

be forced to the back side of the piston in the propeller dome.

The high-pressure oil supplied by the feathering pump overrides the two forces at the front of the piston and forces the piston to the front of the dome, which puts the prop blades in a full-feathered position. Since there is no outlet, the pressure builds up to approximately 500 psi and actuates an electric cut-off switch, turning off the feathering pump.

BE PREPARED TO PULL THE RED FEATHERING BUTTON OUT IF IT DOES NOT POP OUT ON ITS OWN ACCORD AS THE BLADES STOP ROTATING. OTHERWISE, THE PROP STARTS TO UNFEATHER.

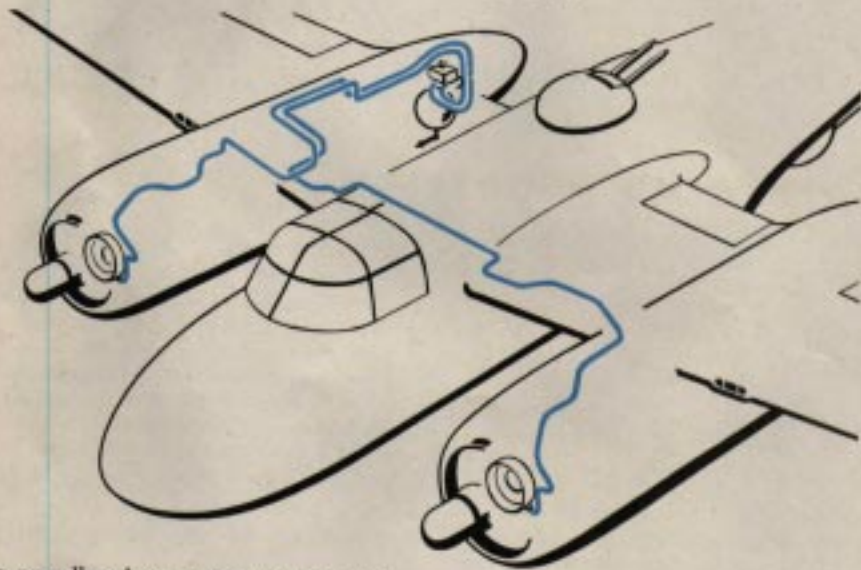
UNFEATHERING PROPELLER



To unfeather the propeller, depress the feathering button until the prop is turning over at approximately 800 rpm. Then release the feathering button. By holding the feathering button down you override the electric cut-off switch and allow the feathering pump to continue to build up pressure. When the pressure has increased to approximately 600 psi a distributor valve redirects the high-pressure oil through the hollow piston shaft to the front side of the piston. This forces the blades toward the high rpm angle and the prop governor is automatically back at work.

See "Single Engine Flight" for complete feathering and unfeathering procedures.

PROPELLER ANTI-ICING SYSTEM



The propellers have anti-icer slinger rings and feeder tubes. An electric pump supplies anti-icing fluid to the slinger ring from a tank holding 3 $\frac{1}{4}$ gallons. The rheostat control for this equipment is on the bottom of the instrument panel.

RADIO EQUIPMENT

Radio serves as the voice and ears of your airplane. Knowing radio equipment is especially important to the A-26 pilot because in most series the pilot is also the navigator. Detailed radio procedure is given in the section entitled "Navigation." For additional information, ask your communications officer. He can show you tricks and proper usage of radio that will help you out of navigation mix-ups.

Command Set (SCR-274-N)

This command set is essentially the same as you have used all through flying school. It consists of three independent receivers which you control on your radio panel. These three receivers cover the following bands:

1. 3.0 to 6.0 Mc.
2. 190 to 550 Kc.
3. 6.0 to 9.1 Mc.

Your three transmitting sets cover the following ranges:

1. 4.0 to 5.3 Mc.
2. 5.3 to 7.0 Mc.
3. 3.0 to 4.0 Mc.

The transmitter selector switch is to the left of your seat. Your transmitting mike button is on the throttle. The transmitters and receivers are mounted behind the pilot's seat.

Radio Reception

The CW-OFF-MCW switch on the pilot's control box belongs on MCW during any normal operation.

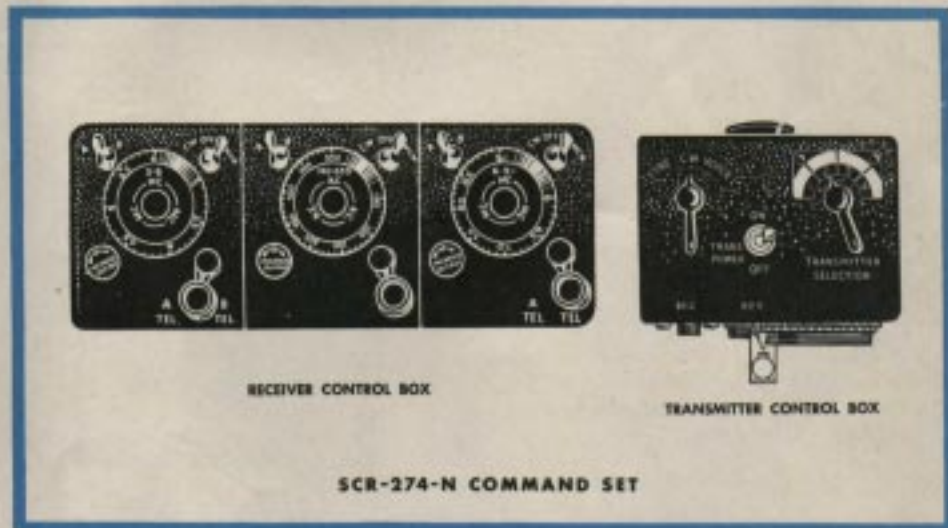
Use MCW to receive:

1. Radio range signals and voice transmissions.
2. Tower transmissions.
3. Interplane transmissions.

Use CW **only** to receive code messages.

You don't use the A Tel and B Tel switch if there is VHF (very high frequency) equipment in the plane. With VHF equipment, always leave the switch in the A Tel position.

If the airplane does not carry VHF, and you want one of your crew members to guard another wave length, plug his headset in the B Tel position and turn his jackbox to the LIAISON position.



For normal use keep the switch in the A Tel position.

Radio Tips

Tune your receivers accurately. Don't sit and strain to hear the tower when it's easy to tune them clearly.

Don't hesitate to ask any communications man to show you how to tune your transmitter and receiver. Although you can't do it in flight, you must know how to do it on the ground.

When receiving, keep the switch on the pilot's control box on MCW.

When transmitting, keep the selector switch on VOICE. (Unless you are sending code.)

If you smell gasoline vapor, turn off all radio equipment until the cockpit has been aired out.

Radio Compass AN-ARN-7

Your radio compass is a receiving unit only, used chiefly for navigation although it supplements the command set for receiving the tower and radio ranges. The receiver unit is on the right-hand side of the fuselage just behind the gunner's compartment. The frequency ranges covered by its four bands are:

Band I	100 to 200 Kc.
Band II	200 to 410 Kc.
Band III	410 to 850 Kc.
Band IV	850 to 1750 Kc.

Select your bands on the radio compass control box, located to the right of the fuel selector valves.

Control

Volume by audio knob.

Turn your operation selector switch to:

COMPASS for directional operation.

ANT. for receiving with vertical sense antenna.

LOOP for receiving with the loop antenna.

Rotate the loop by depressing the LOOP L-R knob toward either R or L. Make finer adjustments with the small tuning knob.

NM-26V Type Radio Compass

Earlier series airplanes use the NM-26V type radio compass. Select your bands on this type

of compass control just as you do on the other. The control steps are identical, with the exception of the loop rotation. On this type of compass you rotate the loop manually by use of a crank on the azimuth control.

The use of this navigation aid is described in detail in "Navigation."

IFF (Identification, Friend or Foe)

Your highly confidential IFF equipment must always be ON whenever you fly in restricted areas. The receiver is just behind the gunner's compartment. It has a built-in destructor unit and is connected to the destructor circuit by a plug. **Never insert this plug except in flight.** The destructor unit, designed to destroy your IFF, can be set off by two buttons in the pilot's compartment or by a pendulum-set impact switch which automatically sets off the destroying charge during a very rough or crash landing.

Interphone

The interphone is the airplane's local phone system for crew members to communicate with each other. It is controlled by the interphone jackbox. Each crew member has his own jackbox. By switching his lever to the CALL position, he can talk to any other crew members, regardless of the setting of their jackboxes.





KEEP THE NEEDLE CENTERED

Radio Compass

ROTATE THE LOOP MANUALLY
WITH THIS CRANK
ON AZIMUTH CONTROL



VHF Equipment

The VHF (very high frequency) set supplements the command set and is used to contact the tower. To operate it:

Switch your interphone jackbox switch to VHF (normally LIAISON position).

Turn on the VHF switch and you are ready to transmit and receive on any selected channel.

You have four channels, lettered from A to D. Ask your communications officer which to use in your area.

VHF Range

The distance range available with VHF is limited to line-of-sight transmission. Any obstacle between you and the station jams your transmission and reception.

HEATING AND VENTILATION

The only purpose of a heating and ventilation system is to keep the pilot and his crew members as comfortable as possible. You'll find that your crew and you yourself operate most efficiently in combat when you are comfortable. Early series A-26's have the Stewart-Warner heaters described here. Later series have no heaters, except in certain theaters where they are needed.

The System

The Stewart-Warner equipment consists of two identical heating and ventilating systems, each operating independently of the other—one for the cockpit and one for the gunner's compartment. Since you control only the system in the cockpit, check your gunner out carefully in the operation of his system.

Don't laugh off the fact that a comfortable gunner draws a steadier bead. It's your responsibility to see that he pampers himself.

Each system consists of two different units. The first is a ducting heater which consists of a combustion chamber with radiating fins and an airduct around it which draws air from the outside.

The other unit is a re-circulating heater which blows the inside air through the heater and back into the compartment.

Master Heater Control Switch

You must turn your master control switch ON before any of the heaters in the airplane

operate. It's on the bottom of the instrument panel in front of the pilot. Move the pedestal control lever from the OFF to the ON position. This automatically lights the heater and starts it burning. You control the amount of heat by a modulator temperature control unit which automatically regulates the amount of air through the heater.

For high altitude or extremely cold weather you move the same pedestal control lever past the ON position to the MAX position. This starts your re-circulation unit and increases the fuel-air mixture in the combustion chamber.

Ventilation Only

With the master heater switch still on, move the control lever to the COLD AIR position. This shuts off the fuel-air mixture to the combustion chamber and you receive ventilation only.

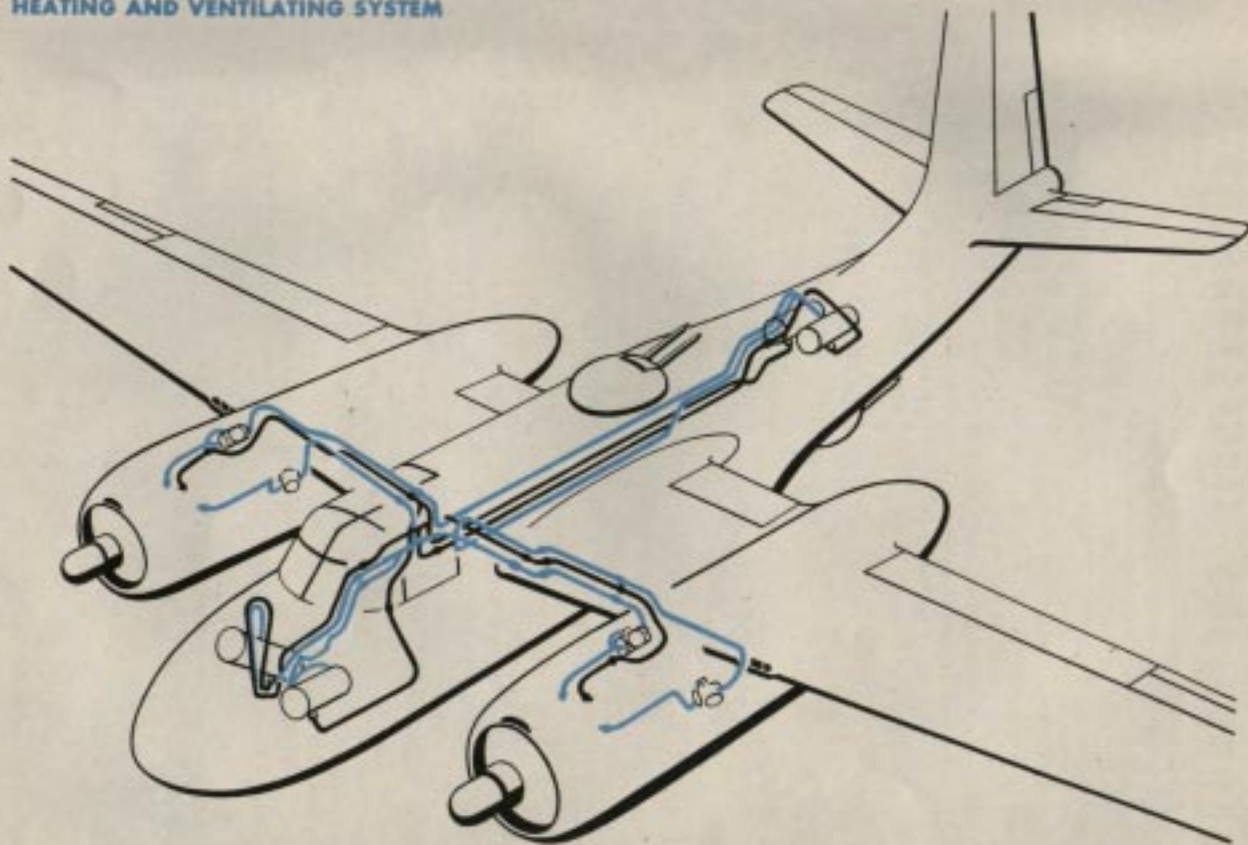
To regulate the amount of cold air ventilating the cockpit, use the INCREASE-DECREASE switch to the right of the master heater switch. This operates a reversible electric motor which opens or closes shutters on the air scoop, regulating the flow of air from the outside. It takes about 30 seconds for the shutters to move from full open to full closed, and you can stop them in any position by returning the switch to the OFF position.

Keep Comfortable



HEATING AND VENTILATING SYSTEM

RESTRICTED



— FUEL VAPOR PRESSURE SUPPLY LINES
— EXHAUST VAPOR SUCTION RETURN LINES

RESTRICTED

EMERGENCY AND MISCELLANEOUS EQUIPMENT

Emergency and miscellaneous equipment is an easy thing to kiss off as unimportant. The chances are that you may get away with it. If you don't, it may cost you your life. Too many good pilots have been lost at sea without their emergency equipment and never heard from again. Too many aircraft have gone down in flames that the pilot or his crew could easily have extinguished inside the airplane.

1. LIFE RAFT

A life raft becomes the most important thing in the world to you and your crew when you are over water and find you must ditch your airplane.

There are only two important factors to insure your safety before each possible over-water flight:

- a. Check your equipment. Know that it's all there and in good order.
- b. Know how to use your equipment.

Your life raft is a 5-man pneumatic type that is stowed on the forward bulkhead of the gunner's compartment. Inflate it with a carbon dioxide (CO₂) bottle attached to the raft.

Your life raft contains the following accessories:

- 3 seamarker dyes
- 1 floating type flashlight
- 1 compass and match container
- 1 shade and camouflage cloth
- 1 sail and water catching cloth

- 1 assembly fishing kit
- 9 units emergency subsistence rations
- 1 scout knife
- 7 cans drinking water
- 1 police whistle
- 1 first-aid kit
- 1 pyrotechnic pistol (5 signals)
- 1 sea anchor
- 3 oars
- 1 hand pump
- 1 raft repair kit
- 1 bailing bucket
- 4 repair plugs
- 1 container assembly
- 40 feet of cord
- 1 signaling mirror
- 1 set religious pamphlets
- 4 tubes sunburn ointment
- 4 water containers
- 1 cellulose sponge

To Use

A. Release your life raft from its position by pulling the emergency release cord. You can do this either from outside the airplane or from the inside through the top escape hatch.

B. Make sure the entire raft is outside the airplane before you inflate it with the CO₂ bottle attached to the raft.

C. Inflate it by twisting the handle on the CO₂ bottle neck before you release the raft.

D. Get your crew members in and paddle away from the sinking airplane.

PLAY IT SAFE

CHECK EMERGENCY AND MISCELLANEOUS EQUIPMENT BEFORE EACH FLIGHT, AND KNOW HOW TO USE IT.

2. FIRE EXTINGUISHERS

You have two emergency fire extinguishers in the A-26, one behind the pilot's compartment and the other in the aft bulkhead of the nose-wheel well.

The fire extinguisher in the nosewheel well should be used only in the open because of the dangerous fumes and gases produced by the carbon tetrachloride charge in this fire extinguisher. You can use the other inside the airplane. Check both these fire extinguishers and be sure that they are always charged and in place.

3. EMERGENCY REPAIR KIT

Your emergency repair kit is stowed in the left nacelle and includes:

Screwdrivers	Wire
Pliers	Bolts
Hammer	Nuts
Wrench	Fuses
Tape	Sparkplugs

Check these emergency supplies. Be sure they're all there. Have you ever tried to make a sparkplug out of a palm tree?

4. FLARES

To the right of the pilot's seat is a canvas bag containing a Very pistol and various colored flares. Check it. Make sure it's there.

5. BOMB HOIST EQUIPMENT

Bomb hoist equipment is stowed in the right nacelle. It includes everything you need to load any type bomb or torpedo that can be used in the A-26.

Also stowed in the right nacelle is a starter hand crank and gear box. You may need this at a strange airport.

Stowed in other positions in the airplane are such important items of equipment as your first-aid kit, fire ax, map cases, and even ashtrays. Check them with your crew chief. Be sure your airplane is fully equipped for every emergency.

Flaps



A-26 flaps are different from those on any other airplane. They are extremely efficient and contribute greatly to the airplane's takeoff and landing performance. They are considered the forerunners of the flaps that will be in general use on all fast, high-powered airplanes in the future. The A-26 flaps are attached to the wing by a linkage which permits greater extension than the ordinary flap.

In operation, they slide back and down, leaving a large slot between the wing and flaps. In this opening, a small deflector directs the flow of air to the top side of the flap, providing a great increase in drag. As you can see, there are two separate flaps and deflectors installed in each wing. Both the inboard and outboard flaps employ the same type of hinge assembly and are simultaneously operated by a single electrical drive unit in the bomb bay.

Flap Drive Unit

The drive unit consists of an electric motor, a gear box, and two limit switches. You control it by a lever on the bottom side of the pilot's control pedestal on the left.

The limit switches automatically stop the electric motors with the flaps at the full UP or full DOWN position. You can stop your flaps in any position by placing the flap lever in the neutral position.

WEIGHT AND BALANCE



Your airplane is designed to fly at gross weights up to 37,000 lbs., provided the airplane is loaded properly. However, the recommended gross weight is 35,500. It is not so much the amount of weight that counts, but where it is loaded.

Many airplanes that are lost for no apparent reason have cracked up because of improper loading. Two of the reasons why a nose or tail-heavy airplane is dangerous are:

1. Difficulty in control. It stalls more quickly and is difficult to land.
2. Dangerously high structural strains when flying in turbulent air.

Expendable Load

Don't forget that your center of gravity (CG) can change materially during flight. The consumption of fuel, expending of ammunition, and dropping of bombs must be considered before the flight begins.

Your airplane may be loaded within safe limits for takeoff and, after your mission, be unsafe to land. Keep your **expendable load** in mind, so that your CG stays within safe limits during the entire flight.

Study your PIF. It explains the use of the load adjuster thoroughly. However, under normal operating conditions, the A-26 is well within safe mean aerodynamic chord (MAC) limits.





ARMAMENT EQUIPMENT

The A-26 is literally a flying gun platform. No other tactical airplane has so much pilot-operated armament.

Two Noses

Your airplane can have one of two different nose assemblies, which are interchangeable.

Nose No. 1

This all-purpose nose may be used in any of the following combinations:

1. Six .50-cal. machine guns.
2. One 37-mm. cannon and four .50-cal. machine guns.

3. One 37-mm. cannon and two .50-cal. machine guns.

4. Two 37-mm. cannon.

5. One 75-mm. and one 37-mm. cannon.

6. One 75-mm. cannon and two .50-cal. machine guns.

Nose No. 2

This is the bombardier nose. It includes bomb-sight brackets and bombing controls, as well as two fixed .50-cal. machine guns.

Gun Turrets

The A-26 has an upper and a lower turret. Each mounts two .50-cal. machine guns and ammunition boxes for 500 rounds per gun. Both these turrets are fired remotely by the rear gunner, who has a 70° field of vision through either the upper or lower periscope head. Both turrets are moved and fired electrically by the gunner at his sighting station. A self-replenishing air bottle charges the guns automatically if they jam.

Upper Turret

The guns in the upper turret have unlimited azimuth rotation and operate between straight up and as low as 5° below horizontal.

Lower Turret

The guns in the lower turret have unlimited azimuth rotation and operate from straight

down to as high as 5° above horizontal. This permits 10° crossfire between the guns in the upper turret and the guns in the lower turret.

Contour Followers

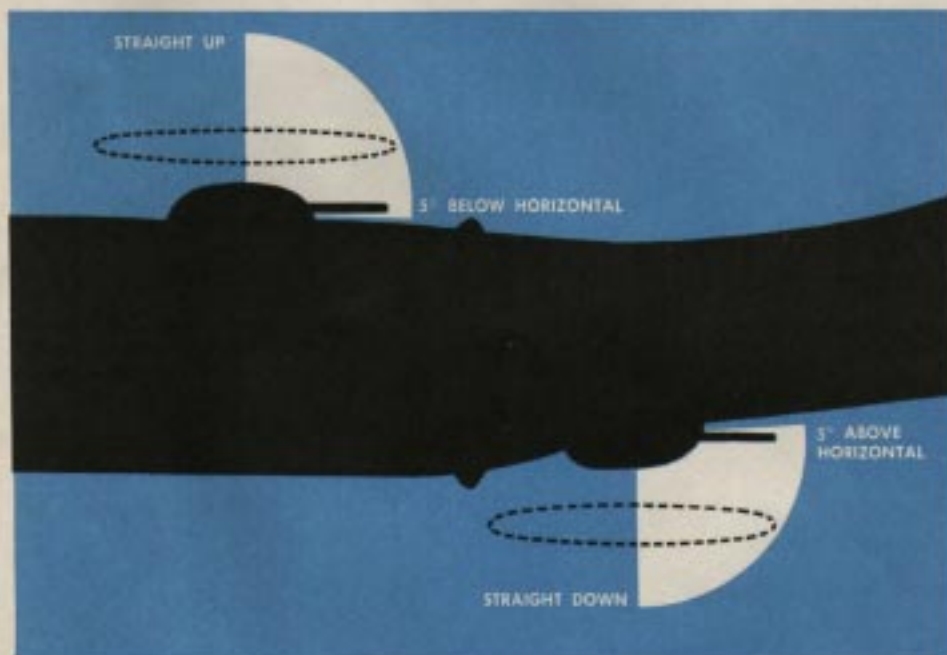
Both turrets have contour followers which limit the zone of fire. The upper turret is prevented from firing lower than 5° broadside or lower than horizontal while the turret is in the forward and aft positions.

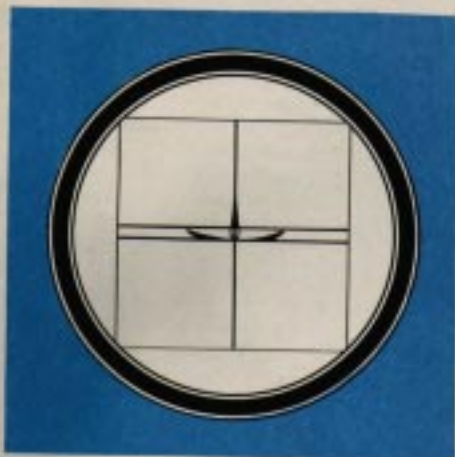
The lower turret guns are forced to point 25° below horizontal when the turret is swung directly forward. The guns are limited to 5° above horizontal in the broadside position.

Automatic Fire Interrupters

Automatic fire interrupters shut off gun fire when either turret is aimed at wingtips, propeller arcs, or tail surfaces.

The upper turret may be locked forward and fired by the pilot with the fixed-gun group.



Tell-tale Indicator

On earlier series A-26's there is an entirely new instrument, the tell-tale indicator. The purpose and the operation of this instrument are described below. On later series the instrument has been eliminated, because the latest A-26 tactics do not require the tell-tale indicator.

The purpose of the tell-tale indicator is to show the pilot exactly where his gunner is aiming. It eliminates confusing interphone chatter and makes it possible for you and your gunner to work together as a highly coordinated team.

A green luminous spot appears on the face of the dial and indicates the direction of fire from the turret guns. For example: When the guns are pointed in the aft hemisphere of rotation, the spot is round. When the guns are rotated to the forward hemisphere, a horn appears on the spot. The guns stop firing when the spot is in the shaded area on the dial.

Wing Guns

Eight .50-cal. machine guns are mounted on hangers suspended from the wings (four on each side) outboard of the engine nacelles. Ammunition boxes are carried in the wing.

Only one charging handle is needed for each set of four guns. They must be charged before takeoff.

Wing Gun Trigger

The trigger for all machine guns is on the left side of your control wheel.

Nose Guns

Regardless of what your combination of armament in the all-purpose nose is, you operate all the guns with one set of controls. The nose guns, like the wing guns, must be charged before you take off. You cannot charge them from the pilot's compartment once you are in the air. The same trigger on the left-hand side of your control wheel operates the nose and wing guns simultaneously.

Bombing Equipment

Your airplane has wing and fuselage bomb racks adapted for carrying variable bomb loads up to 6000 lbs.

Fuselage Bombs

There are four bomb rack panels in the bomb bay, two forward and two aft. The right and left forward bomb rack panels have seven bomb stations each, but only five of them may be used at any one time. The right and left aft bomb rack panels have five bomb stations each, but only three of them can be used at any one time. Each station is plainly marked for the size bomb to be carried.

Heavy Bombs

Bombs of 500 or 1000 lbs. are carried in a single station installed farther forward.

Torpedoes

A second single-station panel is provided between the forward and aft bomb bays to carry two torpedoes.

The A-26 is an extremely versatile offensive weapon. It has tremendous strafing firepower. It can bomb from various altitudes down to skip bombing, and it can launch torpedoes. But remember, although there are 24 bomb stations altogether, only 16 of those stations can be used at any one time.

RESTRICTED

Pilot's Bomb Release Control

Release your bombs from the wings and fuselage electrically by a pushbutton switch on the left side of your control wheel.

Bomb Circuit Selector

With your circuit selector you select either FUSELAGE or WING AND FUSELAGE bomb racks.

Armament Selector Switch

Use your armament selector switch to fuse the bombs for the type of bombing to be done. For impact bombing and to salvo your bombs armed, select NOSE AND TAIL. For delayed action bombing, set your arming switch on TAIL. To salvo bombs safe, set it on OFF.

Rack Selection

Select your demolition racks or fragmentation racks with the switch selector marked DEMOL. and FRAG. The DEMOL. and FRAG. switches have no effect on practice bombs.

Intervalometer

Your intervalometer gives you a choice of single release or automatic train release of fuselage and wing bomb loads. The purpose of this automatic interval release is to provide release of one or all of your bombs at regular intervals measured in feet between impacts.

Wing Bomb Racks

The wing bomb racks each hold a 100, 300, or 500-lb. bomb. To salvo your wing bombs (without salving your fuselage bombs), put bomb selector switch in the WING AND FUSELAGE position, then move the wing rack salvo switch to SALVO. On some models there is just one salvo switch which salvos both wing and fuselage bombs together.

Wing Chemical Tanks

Four chemical tanks may be carried on your wing bomb racks. You fire them by electrical switches on your auxiliary electric control panel. The tanks may be dropped in the same manner in which you salvo your wing bombs.

Torpedo Stations

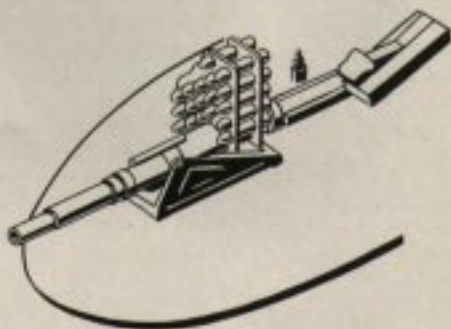
Two torpedoes may be loaded in the bomb bay as alternate armament. When torpedoes are carried, the bomb rack panels and the removable portion of the front bomb bay rail are removed. The bomb bay doors must be left open. Release your torpedoes electrically by the bomb release button with your torpedo circuit switch ON. Salvo your torpedoes manually with the bomb control salvo lever (or switch in some models).

Torpedo Director

You can pull the torpedo director, on a rack over your windshield, into your line of vision when you are ready to make your launching run. You can make adjustments easily with one hand, in flight.

75-mm. Cannon

A 75-mm. cannon, installed in one of the alternate noses, extends back into the pilot's compartment. A gun loader sits on a bicycle seat behind the gun. He has racks for twenty rounds of 75-mm. shells. The empty shells are ejected through a chute into a canvas bag container in the bomb bay. You fire the gun electrically with the button on the left side of the control wheel.



OVER-ALL LENGTH, 132.4 INCHES
WEIGHT, 695 LBS.
MAXIMUM RECOIL, 23 INCHES.



If you had a choice, which would you take: a beautiful girl, a million dollars, or a good crew chief? Not so fast! What good would the beautiful girl and the million dollars do you if you weren't around to enjoy them? That's right; better put the good crew chief at the top of the list. Seriously, you'll find most crew chiefs capable men who are as proud of your airplane as

you are, and just as eagerly sweating out the mission as you and your crew.

The following checklist assumes that you have a good crew chief. The items listed are kept to an absolute minimum and are your responsibility. In combat you may have to preflight your own airplane, so learn all you can about it. Be fussy!

*Don't neglect a single item on the following
pilot inspection check*

OUTSIDE VISUAL CHECK

When you walk to your A-26, look it over. Look for skin cracks, blisters, loose rivets, and propeller nicks. Don't fail to observe every detail of the airplane's general appearance.

Check

Must Be

- | | |
|---|---|
| 1. PITOT COVERS | Off |
| 2. NOSEWHEEL | |
| a. NOSEWHEEL SWIVEL LOCK PINS | Engaged, with cap secure. |
| b. OLEO STRUT | Properly extended. No leaks. No cracks. |
| c. TIRE | Good condition. Properly inflated. No slippage evident. (Ring deflection markers touch the ground when your tires are properly inflated.) |
| d. DOWN-LOCK SAFETY PIN | Removed. |
| e. HYDRAULIC LINES | No leaks. |
| f. UP-LATCH ASSEMBLY | Clearance. |
| 3. LEFT ENGINE NACELLE | |
| a. PROPELLER PULLED THROUGH | Nine blades if engine has not been turned over within 2 hours. |
| b. COWLING AND DZUS FASTENERS | Secure. |
| c. WHEEL CHOCKS | In place. |
| d. HYDRAULIC LINES | No leaks. |
| e. TIRE | Good condition. Properly inflated. No slippage. |
| f. OLEO STRUT | Properly extended. No leaks. No cracks. |
| g. DOWN-LOCK PIN | Removed. |
| h. CANVAS CURTAIN | Zipped shut. |
| 4. RIGHT ENGINE NACELLE | |
| a. Repeat left engine checks in the same order. | |
| b. BOMB HOIST EQUIPMENT | Secure and fastened. |



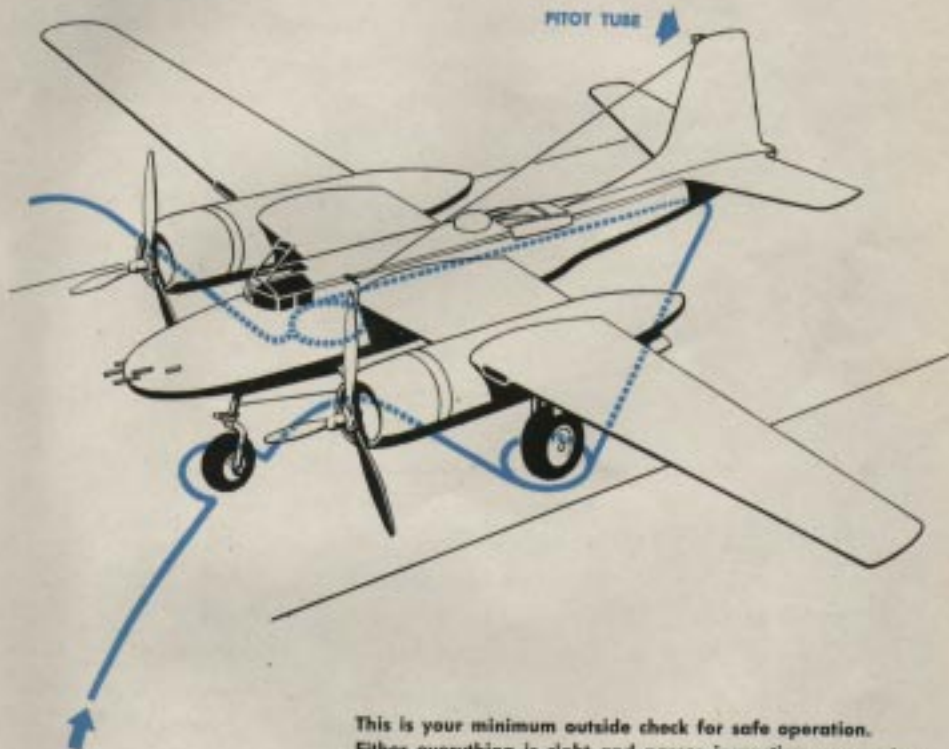
ON TOP OF AIRPLANE

This is your last over-all inspection before you get into the cockpit.

Check

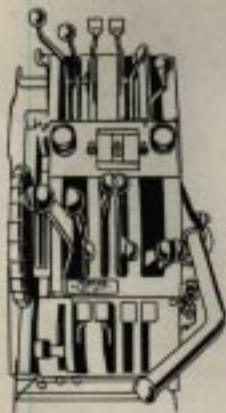
1. GAS AND OIL COVERS Secure.
2. ANTENNA Under good tension.
3. TOP OF WING AND NACELLES . . . Free of skin tears and wrinkles.

Must Be



This is your minimum outside check for safe operation. Either everything is right and passes inspection, or you turn the airplane back to your crew chief for correction. Be thorough. You make this check for the safety of yourself and your crew.

VISUAL INSIDE INSPECTION



Always proceed in this orderly fashion in the cockpit. Do not deviate from it.

*Check**Must Be*

- | | |
|---|------------------------------------|
| 1. FORM 1, WEIGHT AND BALANCE PREFLIGHT FORMS | Checked and signed. |
| 2. LADDER | Pulled up. |
| 3. HATCH | Closed and locked. |
| 4. SEAT AND RUDDER PEDALS | Adjusted for greatest comfort. |
| 5. PARACHUTE—SAFETY HARNESS | On and adjusted. |
| 6. ALL ELECTRICAL SWITCHES | OFF position. |
| 7. HYDRAULIC RESERVOIR | Normal level—hydraulic pressure 0. |
| 8. AIR BRAKE BOTTLE | 450 psi. |
| 9. HYDRAULIC SELECTOR VALVE | On SYSTEM. |
| 10. CROSSFEED—BOMB BAY | OFF. |
| 11. TANK SELECTORS | Both on MAIN. |
| 12. CARBURETOR HEAT | COLD. |
| 13. CARBURETOR FILTER | Direct. |
| 14. WING FLAP HANDLE | Neutral. |
| 15. MIXTURE CONTROLS | IDLE CUT-OFF. |
| 16. PROP CONTROLS | Full INC RPM. |
| 17. THROTTLES | 1/4 open. |
| 18. LANDING GEAR LEVER | DOWN. |
| 19. CABIN HEAT CONTROL | OFF. |
| 20. BLOWERS | LOW. |
| 21. FLIGHT CONTROLS | UNLOCKED. |
| 22. AIR BRAKE LEVER | Safetied on RELEASE. |
| 23. MASTER HEATER SWITCH | OFF. |
| 24. ACCUMULATOR PRESSURE | 650 psi. |
| 25. PARKING BRAKES | On, hydraulic pressure up. |

- | | |
|-------------------------------------|-------------------------------------|
| 26. BOMB BAY DOOR CONTROL | NEUTRAL. |
| 27. CIRCUIT BREAKERS | All up. |
| 28. BOMB PANEL | All switches OFF or NEUTRAL. |
| 29. GUN PANEL | All switches OFF. |
| 30. BATTERY SWITCHES | ON (unless external power is used). |
| 31. COWL FLAPS | Open. |
| 32. OIL COOLER DOORS | As desired. |

STARTING ENGINES

Start the right engine first.



- | | |
|------------------------------------|---------------------------|
| 1. FIRE GUARD | Stand clear. |
| 2. MASTER IGNITION | ON. |
| 3. RIGHT BOOSTER PUMP | On LOW BOOST. |
| 4. ENERGIZE RIGHT ENGINE | Approximately 10 seconds. |
| 5. PRIME RIGHT ENGINE | Approximately 3 seconds. |



6. ENGAGE RIGHT ENGINE Continue to energize.
7. MAGNETO SWITCH BOTH (after engine turns over).
8. MIXTURE CONTROL Move to AUTO RICH when engine fires.
9. SET THROTTLE To 800 rpm.
10. OIL PRESSURE Pressure within 30 seconds, otherwise shut engine off and investigate.
11. BOOSTER PUMPS Right booster OFF. Left booster on LOW BOOST.

Start Left Engine.

1. Repeat the foregoing procedure to start the left engine.

STARTING TIPS



1. If engine does not fire, advance mixture control to AUTO RICH for not more than 3 seconds with engine still engaged. Return mixture control to IDLE CUT-OFF until engine fires regularly, then advance to AUTO RICH.

(Caution: Fire may result if blower section is flooded.)

2. If engine is flooded, open throttle to full forward position with mixture control in IDLE CUT-OFF and engine still engaged, then return throttle to $\frac{1}{4}$ open.

3. Do not continue to operate the starter for more than 60 seconds or it will burn out.

In cold weather prime the engines more than you do in warm weather. See "Cold Weather Operation."

AFTER STARTING ENGINES

Check

1. RADIO
2. HYDRAULIC PRESSURE
3. BOMB BAY DOORS
4. TOWER
5. REMOVE CHOCKS

Must Be

- On.
- 1000 psi.
- Call gunner. Signal alert crew to clear bomb bay doors. Close doors when clear.
- Call for taxi instructions.
- Give thumbs-up signal.



TAXIING



The natural tracking characteristics of the tricycle landing gear make the A-26 especially easy to taxi. Because of this you may have a tendency to pick up too much speed when taxiing straight, necessitating either excessive use of the brakes or fast turns which put dangerous overloads on the gear.

Don't be a taxicab driver. Flashy, hot-pilot ground handling goes hand in hand with sloppy flying. Remember that all airplanes have their limitations on the ground as well as in the air. Develop a smooth, coordinated taxiing technique. There are only a few simple taxiing rules to observe:

1. Always roll straight ahead for a few feet before attempting a turn.
2. Baby your brakes. Good taxiing technique requires a minimum of braking action. Smooth coordination of the throttles and rudder will do the job.
3. Think ahead. Be alert. Be cautious. Avoid last-minute decisions that mean slamming on the brakes and making abrupt turns.
4. Know your terrain. Don't taxi into soft or rutted ground. Examine it first if you are taxiing on a strange airport.

5. Be prop-clearance cautious. Remember that the propeller tips clear a hard surface runway by only 15 inches.

6. Taxi slowly. Use your throttles and rudder, and where necessary, brakes, in one coordinated operation. You can maintain normal taxiing speed with throttles closed (500-600 rpm).

7. When you park, slow the airplane down evenly, maintaining equal brake pressure so the nosewheel remains straight when the airplane stops.



Baby Your Brakes

RESTRICTED

TAXIING TIPS

Good coordination is the main thing to achieve. To make a smooth coordinated turn, avoid abrupt use of your brakes. Don't be a rocking-horse pilot. Rough braking control puts unnecessary strain on the nose gear.

Think ahead. On taxiing down the ramp for any stop or turn, slowly apply pressure on your brake pedals at least several hundred yards before you turn, thereby checking your brakes before you actually need them and insuring smooth braking action.

Always slow your airplane down to at least a fast walk before attempting a turn. Before you park, be sure there is nothing behind the airplane that will be damaged by prop wash.

RUN-UP AND CHECKS

Your engine run-up and check just before takeoff is your last opportunity to detect faulty engine operation.

Don't become mechanical. Think what you're doing and why you are doing it. The steps listed here are the minimum for safety. A short-cut in engine run-up is a short-cut to trouble.

1. IDLE YOUR ENGINES AT 1000 RPM UNTIL

- a. Oil temperature is 40°C.
- b. Oil pressure is 45 psi and relatively steady.
- c. Cylinder-head temperature is 120°C, minimum.



Important EVEN IN COLDEST WEATHER

NEVER ATTEMPT TO HASTEN CYLINDER-HEAD WARM-UP BY
CLOSING ENGINE COWL FLAPS.



2. THROTTLES 1700 rpm.
3. PROP CONTROLS Move full aft, then full forward (repeat and lock).

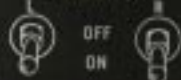
Note

Allow full drops of rpm before returning controls to full forward position. This is to get full circulation of warm oil into the propeller dome to insure maximum efficient propeller governor control.



4. VOLTMETER Both 28.5 volts.
5. GENERATOR SWITCHES Both ON.
6. AMMETERS Parallel within 20 amps.
7. IDLE LEFT ENGINE 1000 rpm.
8. RIGHT ENGINE 2000 rpm, approximately 25" Hg.
9. MAGNETOS Checked.
10. IDLE RIGHT ENGINE 1000 rpm.
11. REPEAT Steps 8 and 9 for left engine.

GENERATOR



TIPS FOR CHECKING MAGNETOS

a. Turn right engine mag switch from BOTH to RIGHT and back to BOTH; then LEFT and back to BOTH. Keep your eye on the right tachometer for a drop of 100 rpm, maximum. A drop of from 0 to 100 rpm is allowable. Allow your tachometer needle to drop and become steady before returning switch to BOTH, but do not run on one magneto for more than 5

seconds. Return mag switches to BOTH momentarily after each check to allow the engine to regain rpm before checking the other mag.

b. Look outside at your right engine cowling and repeat your magneto check. Rough or faulty operation that does not show up on your tachometer reveals itself by unusual shaking and trembling of the engine cowling.

BEFORE TAKEOFF



1. TRIM TABS Aileron, rudder, elevator.
2. FUEL SELECTORS Fullest tanks.
3. CARBURETOR AIR COLD.
4. WING FLAPS As needed (minimum 15°).
5. MIXTURE CONTROLS AUTO RICH.
6. PROP CONTROLS INC RPM.
7. BOOSTER PUMPS HIGH BOOST.
8. ENGINE INSTRUMENTS Normal.
9. FLIGHT INSTRUMENTS AND VACUUM PRESSURE Set and Normal.
10. BATTERIES AND GENERATORS . ON.



On the foregoing checklist, Step 8 requires the following engine instrument conditions:

1. Cylinder-head temperature...150° to 205°C.
2. Oil temperature.....60° to 90°C.
3. Oil pressures.....60 to 80 psi.
4. Fuel pressure.....15 to 22 psi.

Step 9 requires the following to be checked:

1. Turn indicator Set with magnetic compass and uncaged.
2. Artificial horizon Uncaged and level.
3. Altimeter Runway elevation.

This final check is in logical sequence. Do not deviate from it. Any short cut you make is a short cut to trouble. Remember, a smart pilot makes his final check not just because the book says so, but to determine for himself whether to accept the airplane for flight or taxi it back to the line.

Don't be too proud to return your airplane to the flying line if everything does not check within the allowable limits. You can't have a

better reputation in the Air Forces than that of being a fussy pilot.

Make sure your gunner knows that it is his responsibility to have the top turret guns locked forward for all takeoffs and landings.



Because of its inherent stability, tricycle gear, and abundant power, A-26 takeoff is effortless and easy.

Takeoff logically starts with turning your plane so you have a clear view of the base leg, final approach, and runway. When the final approach is clear and you have received permission from the tower to take off, take the runway. **Never take the runway without permission from the tower.**

Turn easily onto the runway and line up. As soon as you are rolling straight, advance the throttles, using smooth accelerated movement to 32" Hg. Make the throttles snug, but do not lock them. Do not use brakes on takeoff except in emergency. Coordinating throttle and rudder gives you adequate directional control.

As you start to accelerate down the runway, quickly check:

1. Rpm.
2. Cylinder-head temperature.
3. Oil pressure.
4. Oil temperature.
5. Fuel pressure.

You do not have time for exact readings. Just be certain that none of the instruments exceed the red-line limits.

It is not necessary to lift the nosewheel off

the runway before takeoff. Lifting the nosewheel too high off the runway actually slows you down and gives you a longer takeoff run.

When you reach takeoff speed (125 mph normally loaded at 31,000 lbs. See Performance Chart.), ease the airplane smoothly off the ground with one definite motion. It's good technique to feel the weight of the nosewheel as you go down the runway, but A-26 takeoff requires no tricks or special procedures. It is as simple as ABC:

- A. Line up with runway and ease power on.
- B. Maintain directional control with rudder and throttles.
- C. At 125 mph, fly airplane off the ground.

Takeoff Tips

As soon as you are airborne, it may be necessary to carry considerable back pressure on the control column because of the drag of the wheels. Do not trim the airplane at this point; it merely magnifies the amount of opposite trim you need as soon as you retract the wheels. Concentrate on attaining single engine speed (135 mph) without losing altitude.

As soon as you're safely airborne and there is no danger of settling back down on the runway, reach forward and push the landing gear

lever full forward. Never brake your wheels before retracting them.

Important: You may have a tendency to ease the control column forward unconsciously as you reach for the landing gear handle. Be extremely careful to avoid this tendency, because at this time you have precious little altitude and cannot afford to lose any of it.

As the landing gear retracts, the center of gravity of the airplane shifts aft, causing the nose to rise sharply. After you are safely past 135 mph (single engine speed), reduce throttle settings to rated power (see Cruise Control Chart) and put the airplane in a climb at 170 mph. Place the flap handle in the UP position and trim for proper climb attitude. Return landing gear and flap handles to neutral.

Short-field Takeoff

Short-field takeoff is one of the most important maximum performance maneuvers you learn in the A-26. You may never need to squeeze the most out of your airplane on takeoff in the continental United States, but in the small operational fields in the war theaters, short-field takeoff becomes usual instead of unusual procedure.

The short-field takeoff in this airplane differs little from the normal takeoff.

For short-field takeoff:

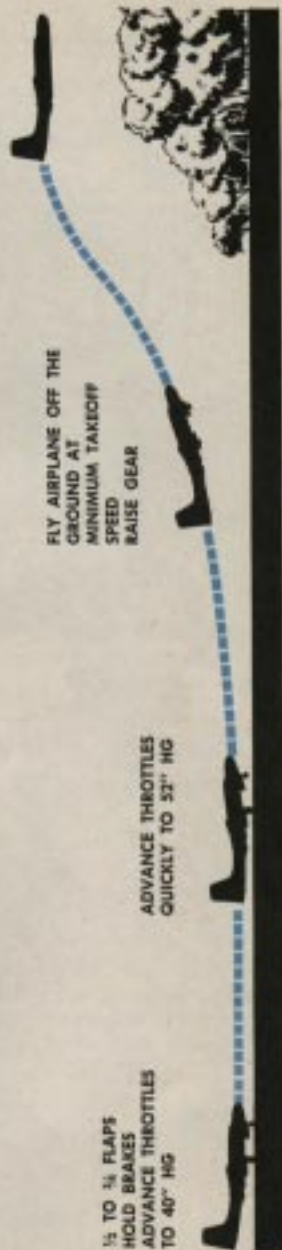
1. Use every inch of available runway. Line up with your nosewheel straight.
2. Use $\frac{1}{2}$ to $\frac{3}{4}$ flaps.
3. Hold your brakes and advance throttles to 40" Hg.
4. Release the brakes evenly, and as you start to roll, advance the throttles quickly to 52" Hg., maintaining directional control with the throttles and rudder.
5. Fly the airplane off the ground at minimum takeoff speed (see Performance Chart).

Crosswind Takeoff

Crosswind takeoff presents little or no problem in the A-26. With the tricycle gear there is little tendency for the airplane to weathercock on the takeoff run. When you are airborne, correct for the crossdrift with a coordinated crab.

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Short-field Takeoff



CLIMB AND CRUISE



The A-26 achieves its greatest rate of climb at approximately 160 IAS, but for added safety and visibility, climb the airplane at 170 mph IAS.

Climb with a series of gentle turns to avoid blind spots in forward vision.

Check your oil and cylinder-head temperatures frequently and make certain they stay within operating limits during the climb.

Always climb with the mixture control in AUTO RICH.

Be comfortable. After you have established the proper airspeed and attitude, trim your airplane so it climbs hands-off.

Don't become a trim-cripple. Fly the airplane first—then trim for comfort.

Leveling Off

Climb to approximately 500 feet above desired cruising altitude before you begin to level off.

After leveling off, slowly reduce your power settings to normal cruise (see Cruise Control

Chart), then lower the airplane's nose and descend to cruising altitude. This is an old airline pilot's trick to attain the proper flight attitude. It can mean added airspeeds of 5-10 mph at the same power settings.

Learn to be flight-attitude conscious. It is the secret of maximum cruising airspeed.

Next turn your booster pumps off one at a time, and keep an eye peeled on your fuel pressure gage to make sure that your pressure stays within operating limits. The high power settings required for takeoff and climb draw a much larger amount of fuel to the carburetor. You need your booster pumps for this extra load until you have established your normal cruise.

Adjust your cowl flaps and oil cooler doors as soon as possible to maintain proper engine operating limits. Carrying them open more than is needed creates burbles that cut your airspeed as much as 10 mph. As a general rule, start to close cowl flaps and oil cooler doors as soon as your cylinder-head temperatures are down to 190°C.

Be alert. Check your instruments and make sure all your temperatures and current power settings are within proper limits before you move the mixture control to AUTO LEAN.

Here's an important mixture control tip: **Never use AUTO LEAN when you are operating above blue-line limits, or 62.5% power.**

Trimming Technique

Remember that careful, proper trimming enables you to squeeze that extra 5 mph more out of the airplane at any power setting. Rough overtrimming is a sure mark of poor pilot technique.

Observe These Trimming Rules:

1. Hold airplane straight and level.
2. Trim to relieve manually held pressures:
 - a. Trim elevators.
 - b. Trim rudders.
 - c. Trim ailerons.
3. Release controls to test trim.

4. Check needle and ball. Make minor corrections as needed. Your airplane is not trimmed unless needle and ball are centered.

Stay Alert—Don't Goof Off

Develop the habit of making a **complete cockpit check** at regular intervals during flight. Many an otherwise good pilot who knows and follows correct procedures and uses good technique, has goofed off in flight to wake up later highly embarrassed to find, for example, that he has run a tank dry and lost an engine.

And don't think it can't happen to you! On long flights engine noise, vibration, and concentration cause fatigue. And fatigue causes a good pilot to goof off unless he forces himself to check his cockpit completely every 15 minutes.

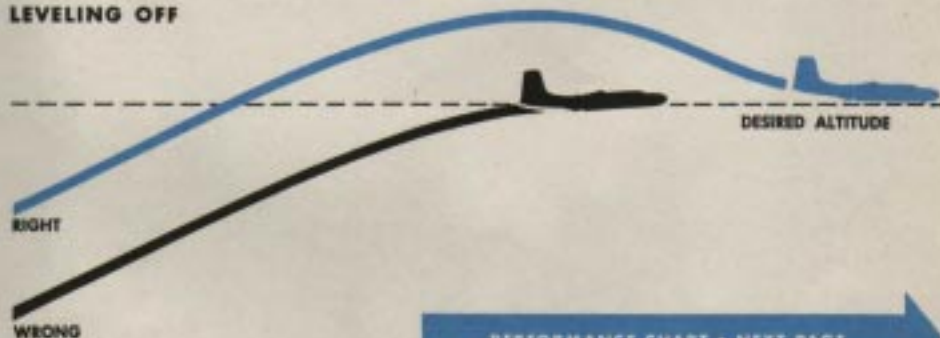
Remember, it only takes a few seconds—it may save a lifetime!

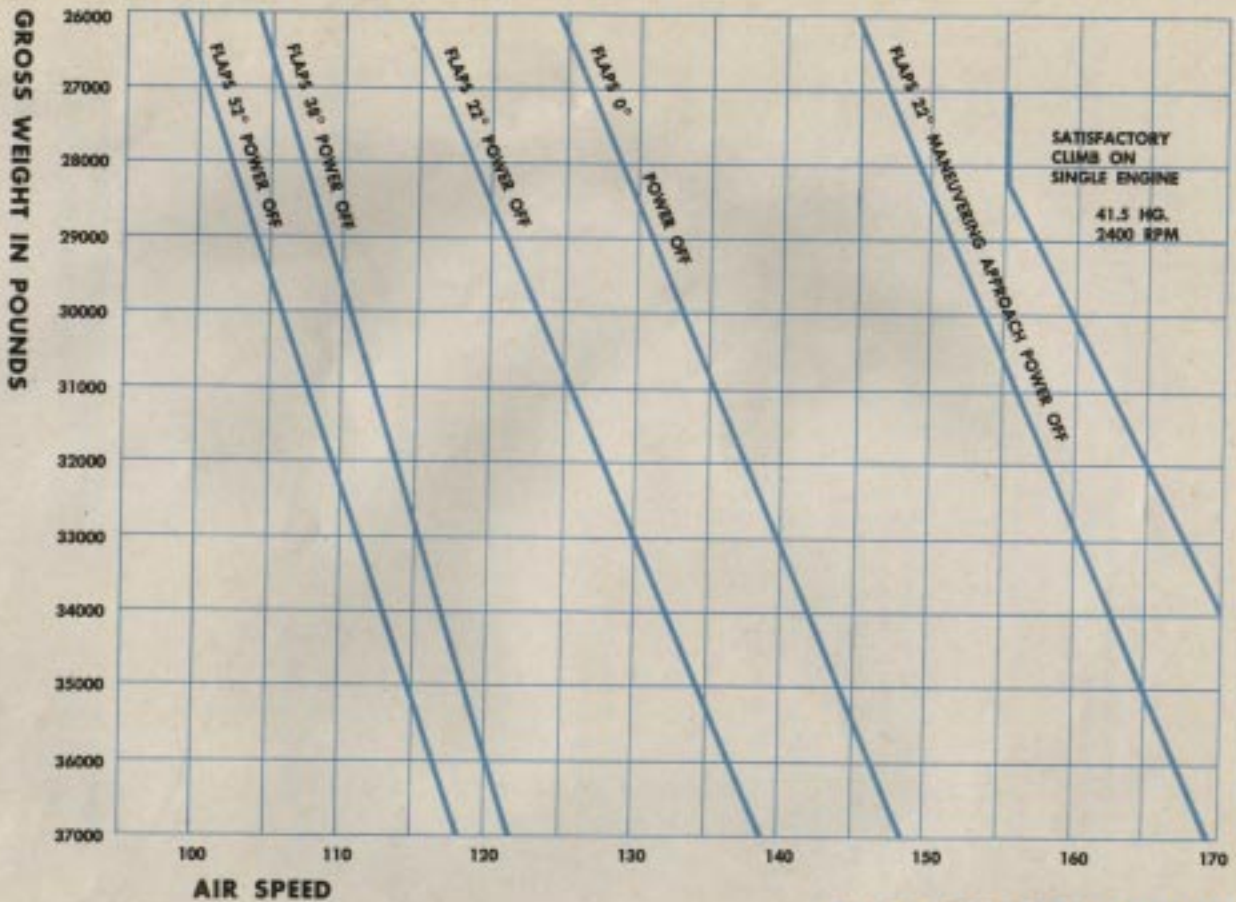
Performance Chart

Study the simple chart on the next page. It gives complete performance data on the A-26, established by engineering test pilots and checked and edited by AAF test pilots and training commanders.

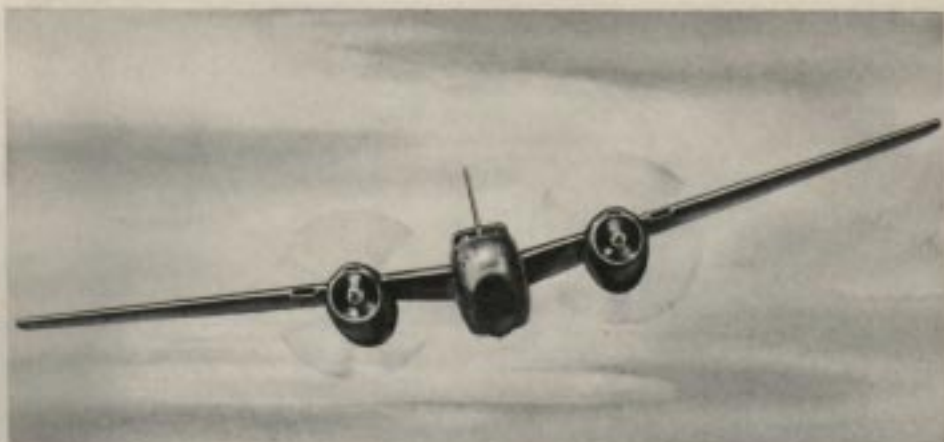
To use the chart, first determine the gross weight of your airplane and follow that line up the graph to determine stalling speeds under various conditions. It is simple and easy to use.

LEVELING OFF





PERFORMANCE CHART



FLIGHT CHARACTERISTICS

The A-26 is a pilot's airplane. If you have not already flown it and discovered that for yourself, a description here of its handling abilities might read like superlative circus publicity. If you have flown the airplane you would find

that same description inadequate to the point of understatement. In the meantime—ask the man who flies one.

Like all high-speed specialized aircraft, the A-26 has limitations you must observe strictly.

The following maneuvers are restricted:



a. All acrobatics.

Loops, spins, rolls and violent stalls are prohibited. The airplane has a wingloading of 60 lbs. per square foot normally loaded with flaps up. It was not designed for air circus maneuvers or student acrobatic training.

b. Vertical banks.

Remember that the A-26 has a high wing-loading, and your stalling speed increases with your rate of bank. For example, at 31,000 lbs. gross in a 60° bank with the airplane clean and power off, your airplane stalls at 192 mph (42% higher in a 60° bank than in level flight).

All these maneuvers are prohibited chiefly because of the high wingloading of the airplane. Take the airplane designer's and your instructor's word for it. Don't experiment.

STALLING SPEEDS AT NORMAL LOADS (31,000 lbs.)

(See Performance Chart)



POWER ON (12")	125	CLEAN
POWER OFF	135	CLEAN
POWER ON (15")	100	WHEELS AND FULL FLAPS
POWER OFF	105	WHEELS AND FULL FLAPS

DIVING SPEED LIMITATIONS

The airplane accelerates rapidly when you dive it. As your airspeed builds up, the controls become more rigid. **Always allow more altitude for your pullout than you think you need.** Recovery from a high-speed dive is the only flight condition in which trim tab control is recommended to assist manual control. **Be careful. Use your elevator tab slowly and gradually.** At first there is little or no appreciable effect, but avoid overtrimming because control takes hold very quickly.

Anticipate the leveling out after pullout and crank forward the trim used to assist the pullout. Abrupt pullouts are dangerous in the A-26. It is possible to build up loads and stresses that the wings and tail section cannot stand.

When trimming out of a dive, handle the elevator trim wheel with great caution.



GROSS WEIGHT	DIVING SPEED LIMITATIONS
26,000	425 IAS
32,000	400 IAS
35,000	360 IAS

TIPS ON FLIGHT CHARACTERISTICS

To make a coordinated turn, lead with your aileron and, as you settle into your turn, follow through with the rudder. As you continue in the turn there is an increasing necessity for back pressure on the control column. This is caused by the non-servo trim tabs.

The A-26 stalls normally and has no tendency to drop either wing. The wing roots stall out

first, giving a definite shuddering effect and plenty of warning before you reach the actual stall. When it stalls, the nose drops straight and rapidly.

Be a pig for altitude while getting acquainted with the A-26. Don't forget that it has an extremely high wingloading and needs plenty of room for recovery.

LANDING

Good landings are planned—not made



FULL FLAPS—ALMOST LEVEL ATTITUDE

Actual contact with the runway is not landing, but the last step of the landing procedure.

Before you call the tower, make a thorough before-landing cockpit check. Your landing procedure starts with your initial radio call to the tower.

The tower tells you:

1. Wind direction and velocity.
2. Traffic pattern and conditions.
3. Altimeter setting.

Enter your downwind leg of the traffic pattern at 160 mph indicated. Drop $\frac{3}{4}$ flaps to increase visibility, and make the following cockpit check.

1. Fuel supply.....Select fullest tanks
2. Mixture control.....AUTO RICH
3. Props2400 rpm.
4. BoostersHIGH
5. BlowerLOW
6. Hydraulic pressure.....850 to 1000 lbs.
7. Call for position (landing number) in traffic when opposite tower on downwind leg.

Follow these seven items in order; never deviate from them.

Turn on your base leg in accordance with

local traffic regulations. On most traffic patterns you drop your wheels when the airplane is 90° to the runway (about $\frac{1}{2}$ the width of the base leg).

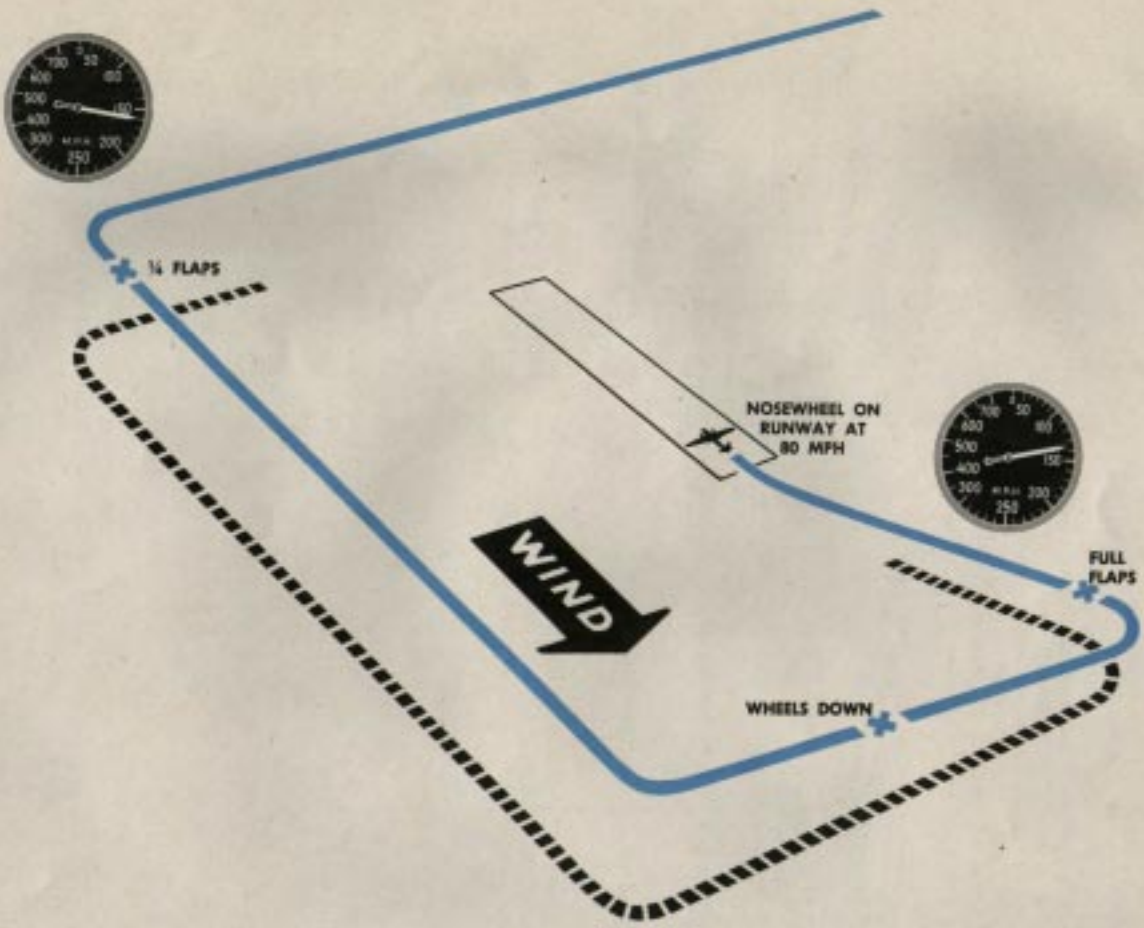
To Lower Wheels

Move the landing gear lever from NEUTRAL to the UP position momentarily. Then move it to the DOWN position. (This procedure is recommended because it relieves any possible pressure on the up-lock.) Leave the landing gear handle in the DOWN position.

After the gear has extended, make the following checks:

1. Landing gear indicator.
2. Warning light.
3. Nose gear (visual check through cockpit floor window).
4. Hydraulic pressure gage.
5. Visual check of main wheels.

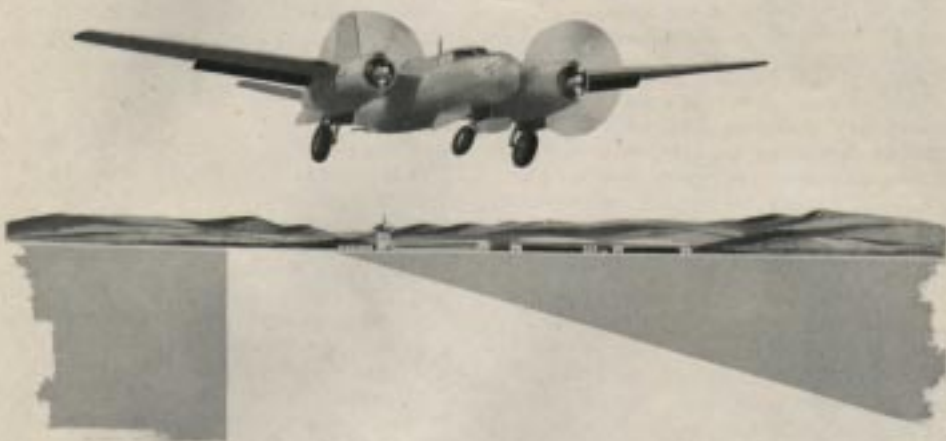
While turning on to your final approach, check your landing gear indicator and warning light for gear down and locked. As an added precaution, visually check all three wheels, as well as your hydraulic pressure gage.



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DRAW TRAFFIC PATTERN OF YOUR FIELD ON THIS PAGE.

GO-AROUND PROCEDURE



To land or not to land should never be a question. Either you are set up for a good landing or there are factors in traffic or in your approach that make go-around procedure wise.

It is obvious that if an airplane on the ground threatens to taxi into your landing path, precautionary go-around is absolutely necessary. There are times when go-around may not be absolutely necessary from a danger standpoint. When in doubt, always apply power and go around. If you are not absolutely sure you are set up for a good approach and landing, go around and set up another landing.

It doesn't embarrass seasoned pilots to apply power and go around when they are not completely satisfied with their approach, so don't let it embarrass you. Keep this in mind: **Unless you are set up for perfect landing—go around.**

Keep these two factors in mind on the go-around:

1. Decide early. Don't hold a lengthy debate with yourself about whether to go around. The longer you wait the more critical your position becomes.

2. Be airspeed conscious. Get those throttles on and pick up single engine airspeed as quick-

ly as you can. Know and be deliberate in your procedures.

Procedure

1. Advance throttles quickly but smoothly to 52" Hg. (This is the only time you add power by advancing throttles before advancing rpm.)

2. Immediately advance rpm to 2700. (Slight engine overspeeding may occur. Don't let it worry you.)

3. Raise landing gear. (As you advance your throttles and raise your gear the trim changes considerably. Fly the airplane. Then trim if necessary.)

4. Raise flaps as soon as you have sufficient airspeed and altitude.

5. Reduce power to normal climb setting as soon as flaps are up and you have obtained critical single engine speed.

6. Adjust your cowl flaps and oil cooler doors as necessary.

If you decide to make your go-around early enough, you may not require full power and thus won't need to change your propeller controls. However, the important factor is airspeed. Never sacrifice airspeed for power.



Approach

Line up with the center of the runway as you roll out on the final approach and lower flaps. Stay lined up with the center of the runway throughout the entire approach. Adjust your throttles for a constant airspeed and rate of descent, and aim for a spot landing on the first 300 feet of the runway. Use power when necessary and establish a constant glide path during the first half of your approach. A normal approach (with airspeed of 125 mph) can best be maintained with approximately 25" Hg.

Trim the airplane to relieve excessive control pressures during the final approach.

Landing

A good landing depends on a good flare-out as well as a good approach. One without the other is useless. During final approach and landing always pick up a low wing with rudder. Break your glide smoothly and gradually until the airplane assumes a landing attitude. As you approach this landing attitude after breaking the glide, smoothly retard the throttles and at

the same time put additional back pressure on the stick to make a smooth ground contact.

Always fly the airplane onto runway. Avoid a stall landing. If you let the airplane stall completely while it is still in the air it is impossible to hold the nosewheel off the ground.

Anticipate contact with the ground so that you can immediately apply back pressure to hold the nosewheel off.

After the airplane is on the ground and power is completely off, avoid holding the nosewheel too high; lower it onto the runway at approximately 80 mph.

You can add drag to shorten the landing roll by putting the mixture controls in IDLE CUT-OFF, which allows the props to windmill. Do this only on short runways when absolutely necessary. Remember to return the mixture control to AUTO RICH before the props stop.

As soon as practicable, apply both brakes gently to test them. At the same time:

1. Turn booster pumps OFF.
2. Put propeller controls full forward.

Bring the airplane to a slow roll by applying pressure on both brakes.

Clear the runway as quickly as possible, and then complete this check:

1. FlapsUP
2. Oil cooler doors.....OPEN
3. Cowl flapsOPEN

Full-flap Landings

Under normal conditions there is only one correct way to land the A-26, and that is with full flaps. Remember that the A-26 is a new and advanced airplane. The laminar flow wing and the high-efficiency flap set up entirely new landing problems and a different feel.

The airplane is designed for full-flap landings. With their use and the resulting drag, the landing roll is normal and you need a minimum amount of brakes.

In a $\frac{3}{4}$ -flap landing the airplane literally seems to scoot on the landing roll and excessive use of brakes is unavoidable. The visibility in a $\frac{3}{4}$ -flap landing is restricted by the nose-high attitude. The last $\frac{1}{4}$ -flap extension is all drag, and serves as an effective air brake.

The A-26 full-flap landing does not feel like an A-20 landing or a B-26 landing or like anything else you have ever landed. The high-efficiency flaps are literally air brakes of a totally new design. Remember that during your transition you have to develop a new landing technique.

When you set up your glide path, maintain your airspeed with power. Flare out in a level, not a nose-high attitude. Fly onto the runway in this level attitude just before the stall occurs. Carry 10" to 12" Hg. of power until your main gear touches the runway. **Do not cut your power until you make contact.**

Continue on the landing run holding the nosewheel off the runway until you reach approximately 80 mph. Then ease it on gently.

One new A-26 pilot accurately described a normal landing as "flaring out and buzzing the runway until your wheels touch." After the main gear is on the runway, cut your power immediately. Your nosewheel will not be more than 6 or 8 inches off the ground.

Be alert. Use back pressure on the control column to keep the nosewheel off the ground until you have slowed down your landing run.

$\frac{3}{4}$ -flap Landings

Your first landings are $\frac{3}{4}$ -flap landings to acquaint you with cockpit procedure. They do not differ much in feel from A-20, B-25, or B-26 landings.

During transition, while you are still making $\frac{3}{4}$ -flap landings, notice the restricted visibility because of the nose-high attitude. Also, notice the airplane's tendency to scoot and not lose speed after making contact with the ground. To offset this, drop full flaps as soon as you have made contact with the ground. You'll be surprised at the extreme efficiency of these new flaps and how they materially shorten your landing roll even after you are on the ground.

Refer to the table showing stalling speeds. Learn and remember the stalling speeds at different loads and flap settings.

Full-flap (Power-off) Landings

Power-off full-flap landings require a higher airspeed, an extremely steep glide path, and a more gradual flare-out. You learn these after you have learned normal landings.

No-flap Landings

Your instructor will demonstrate no-flap landings, although under normal operating conditions you never land the airplane without flaps.

If, however, your flaps fail to work and a no-flap landing is necessary, plan your approach with extra caution and keep these things in mind:

1. Visibility is restricted because of the extreme nose-high attitude.
2. The airplane stalls at a much higher airspeed.
3. You need every inch of the runway for effective braking to slow the airplane.
4. Get the nosewheel on the runway as soon as possible to begin braking action.

PROCEDURE



ADVANCE THROTTLES TO 52" HG



ADVANCE RPM TO 2700



RAISE LANDING GEAR



RAISE FLAPS

Clear the Runway Area

STOPPING ENGINES

There is a logical reason behind the following sequence for stopping engines. Follow it:



1. Set parking brakes.



2. With engine idling at 1000 rpm, pull right mixture control to IDLE CUT-OFF.



3. Open bomb bay doors—check hydraulic pressure.

4. Pull left mixture control to IDLE CUT-OFF.



5. Slowly advance throttles full open while props stop turning.

6. After props stop turning, cut all switches, including the radio.



7. Close the throttles and lock the controls.



8. As soon as chocks are in place, release the parking brakes. (If the brakes are hot, leaving the parking brakes on may cause the brakes to warp or freeze.)

9. Complete the Form 1.

YOUR FLIGHT IS NOT OVER UNTIL FORMS 1 AND 1A ARE PROPERLY FILLED OUT



NIGHT FLYING

Your ability to fly at night is directly related to your ability as an instrument pilot. It consists of being alert, knowing your cockpit, and relying on your instruments.

Your check for night flying is the same as in the daytime, with this exception: **You must check all your lights for proper operation before you taxi out.**

Tips

Carry a flashlight. Have it handy in case of an emergency.

Clean your windshield.

Use the landing lights only as much as necessary while taxiing.

Taxi slowly and be doubly alert for other airplanes and obstructions.

Keep all unessential lights turned off.

Turn your cockpit lamps down so there is no glare.

Night Takeoff

Check your flight instruments carefully before takeoff. **Be sure your landing lights are fully retracted before takeoff.** They set up a violent aileron flutter if they are extended at all. Night takeoff is practically the same as instrument takeoff. Rely on your flight instruments as soon as you leave the ground.

Keep your altimeter going up and your rate of climb on a good, steady climb indication. Check your artificial horizon for wings level.

Establish a steady climb and keep power on until the landing gear is up. Then reduce the power and retract the flaps.

Your airspeed picks up rapidly and you will be well over single engine flying speed. Continue your climb at normal power settings.

Never drop the nose to gain airspeed. Too many pilots have flown back into the ground this way.

Don't attempt to fly half contact and half instruments. Stay on instruments until you reach safe altitude.

Night Approach and Landings

Your approach and landing procedure is much the same at night as it is in the daytime, except that after calling the tower on the downwind leg, you extend your landing lights and then return switch to the OFF position. This leaves your lights extended and ready for use when you switch them on before landing.

Use a little more speed on the night approach. Turn on your landing lights when you are near the ground.

When making a night landing at a strange field, watch carefully for obstructions. Ask the tower for complete information.

The general tendency is to undershoot at night, so aim your glide path to allow for this.

Test your brakes soon after landing and start to slow up immediately. It is difficult to judge the end of the runway at night.

EMERGENCIES



SINGLE ENGINE FLIGHT

**If you know what to do and how to do it,
A-26 engine failure merely means single engine flight
and not an emergency at all.**

Single engine flight has long been one of the most kicked-around subjects in the AAF. Hangar pilots have been the great experts; they have reached many important decisions. The only trouble with their decisions is that in most cases they are not true. Actually there is nothing unusually complicated or dangerous about A-26 single engine flight or emergencies **if you follow orderly procedure:**

- A. Maintain single engine airspeed.
- B. Maintain directional control.
- C. Be positive and deliberate in your procedure.

Engine failure on a 2-engine airplane is considered an emergency, but if you know what to do and how to do it, engine failure merely means single engine flight and not an emergency at all.

For a green pilot, almost everything unusual that happens in the air is an emergency. For a seasoned pilot almost everything that happens in an airplane can be overcome by an orderly procedure, and the actual emergency stage is seldom reached.

To become proficient in single engine flight, you practice simulated engine failure.

Single Engine Flight

In A-26 single engine procedure there are 10 operations to complete:

1. Throttle—Back on the bad engine.
2. Feather switch—Depress bad engine button momentarily.
3. Mixture control—IDLE CUT-OFF on bad engine.
4. Vacuum selector valve—Turn on good engine.
5. Magneto switch—OFF when prop stops.
6. Prop control—Increase rpm to 2300 on good engine (green zone).
7. Mixture control—AUTO RICH (green zone).
8. Throttle—Increase to 36" Hg. on good engine (green zone).
9. Trim—To hands-off.
10. Cowl flaps and oil cooler door—Closed on bad engine.

After you complete the foregoing procedure, watch operating temperatures of good engine.

Trim the plane to the needle-ball and maintain a cruising attitude to keep airspeed as high as possible.

In cruising flight you will have an IAS of approximately 250 mph when starting single engine practice. The airplane is easy to control at this speed.

After several simulated single engine flights, cut the airspeed down to 150 mph and slowly reduce one throttle to note the great difference in rudder pressure necessary to keep the plane straight and level at lower speeds. By this you can realize how much more rudder pressure it would take if you lost an engine on takeoff with maximum power setting. Therefore, keep in mind that airspeed and engine power are the factors governing the controllability of the airplane while on single engine.

Practice shallow single engine turns both away from and into the dead engine **only if you have single engine airspeed or above.**

Never make a quick movement on the controls or change power settings on the good engine in a turn at these low speeds.

Starting Engines in Flight

When starting the engine again, remember to treat it like a cold engine that you are first starting in the morning (determine by cylinder-head temperature).

1. Prop control—Low rpm (back).
2. Open throttles $\frac{1}{4}$.
3. Turn mag ON.
4. Hold down red feathering button until the prop turns over 800 rpm, and then release it.
5. Push mixture control to AUTO RICH.
6. Set throttle to about 15"; with prop control clear back you will have about 1200 rpm. When cylinder-head temperature reaches 80°C, increase prop to 1500 rpm and throttle to 20" and then gradually return to normal cruising power after reaching 100°C cylinder-head temperature. Tip: To help increase cylinder-head temperature slow the airplane down to about 160 IAS.
7. Adjust cowl flaps and oil cooler doors as necessary.
8. Trim the airplane while performing the foregoing procedure.

Engine Failure on Takeoff

Engine failure on takeoff requires cool, quick thinking plus correct procedure. If your engine cuts out before you are airborne, cut your power immediately and bring the airplane to a stop.

If you are off the ground and it is possible to hold the airplane in the air, your old familiar A B C procedure still holds.

A. Get single engine speed (135 mph) as quickly as possible. (This may mean lowering the nose, even at low altitudes. But get that airspeed up at all costs.)

B. Maintain directional control.

C. Start your procedures immediately. Every single engine emergency happens under slightly different circumstances. While you're learning single engine procedure in the A-26, rehearse in your own mind what you would do if your engine cut on takeoff.

The No. 1 job, of course, is to maintain what

airspeed you have and to increase it as rapidly as possible until you reach 135 mph.

The No. 2 job is to get directional control.

No. 3 is to begin orderly procedure to continue single engine flight. It requires split second decisions and good pilot technique, but **most of all it requires cool thinking!** Don't get rattled. If you lose an engine on takeoff you have your hands full, but if you use your head and know your procedures you won't get hurt.

The most common mistake is reaching for everything in the cockpit in one mad scramble, which often results in feathering or cutting the good engine instead of the bad engine.

If you lose an engine at a critical point during takeoff or climb, don't hesitate to reduce power on the good engine if necessary to maintain directional control. Next, don't hesitate to sacrifice altitude in order to maintain or gain precious single engine speed. **Do not feather a bad**

engine if you are getting some power out of it—at least, not until you have passed the critical stage.

Single Engine Landings

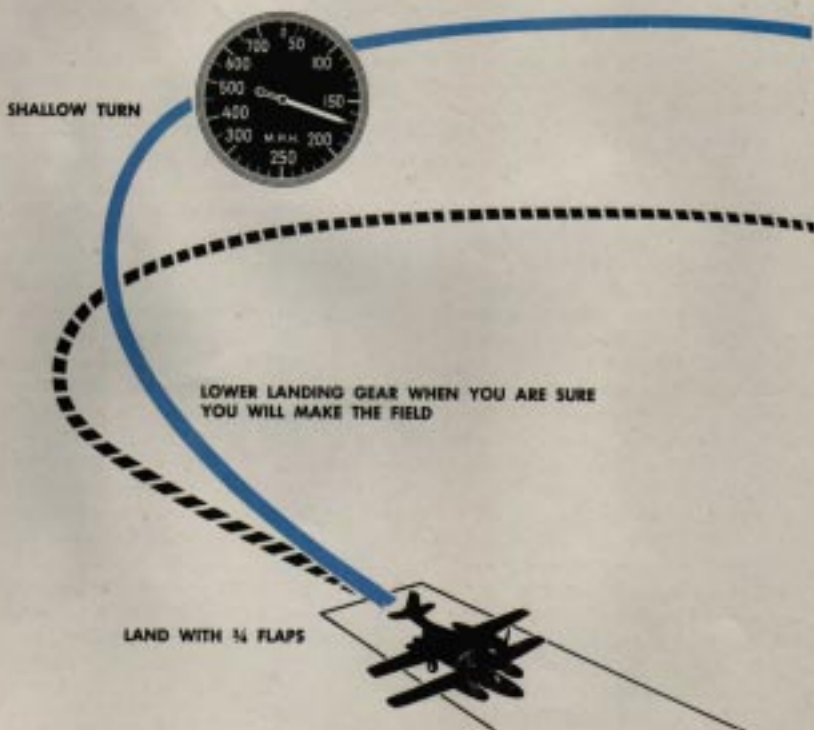
Single engine landings in the A-26 do not differ greatly from normal landings. For single engine landings:

1. Fly your pattern larger and make your turns shallow.

2. Make your approach slightly higher to avoid any need of adding a big burst of power at the last moment. Maintain an airspeed of 150 mph on your single engine approach and do not lower landing gear until you are sure you will make the field.

3. Land with $\frac{3}{4}$ flaps.

4. Trim as you need to on final approach. You can easily override remaining trim after flare-out.



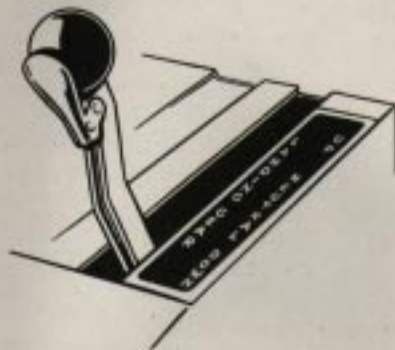
HYDRAULIC SYSTEM FAILURE

The A-26's hydraulic system is well-designed and dependable in operation. But as long as aircraft fly, some hydraulic emergencies will occur, and in the war theaters flak will continue to puncture lines and tanks. So study the diagram and know the hydraulic system.

If you know the system and how to use it, you will find that most hydraulic emergencies are not real emergencies at all.

If the main system fails, be sure of what you are doing. First figure out what your trouble is and then act to correct for it.

To Lower Landing Gear With Emergency System



1. Put the main gear lever in DOWN position.



2. Turn emergency hydraulic selector valve to LANDING GEAR DOWN.



3. Operate hand pump (about 170 strokes are needed to extend and lock the gear).

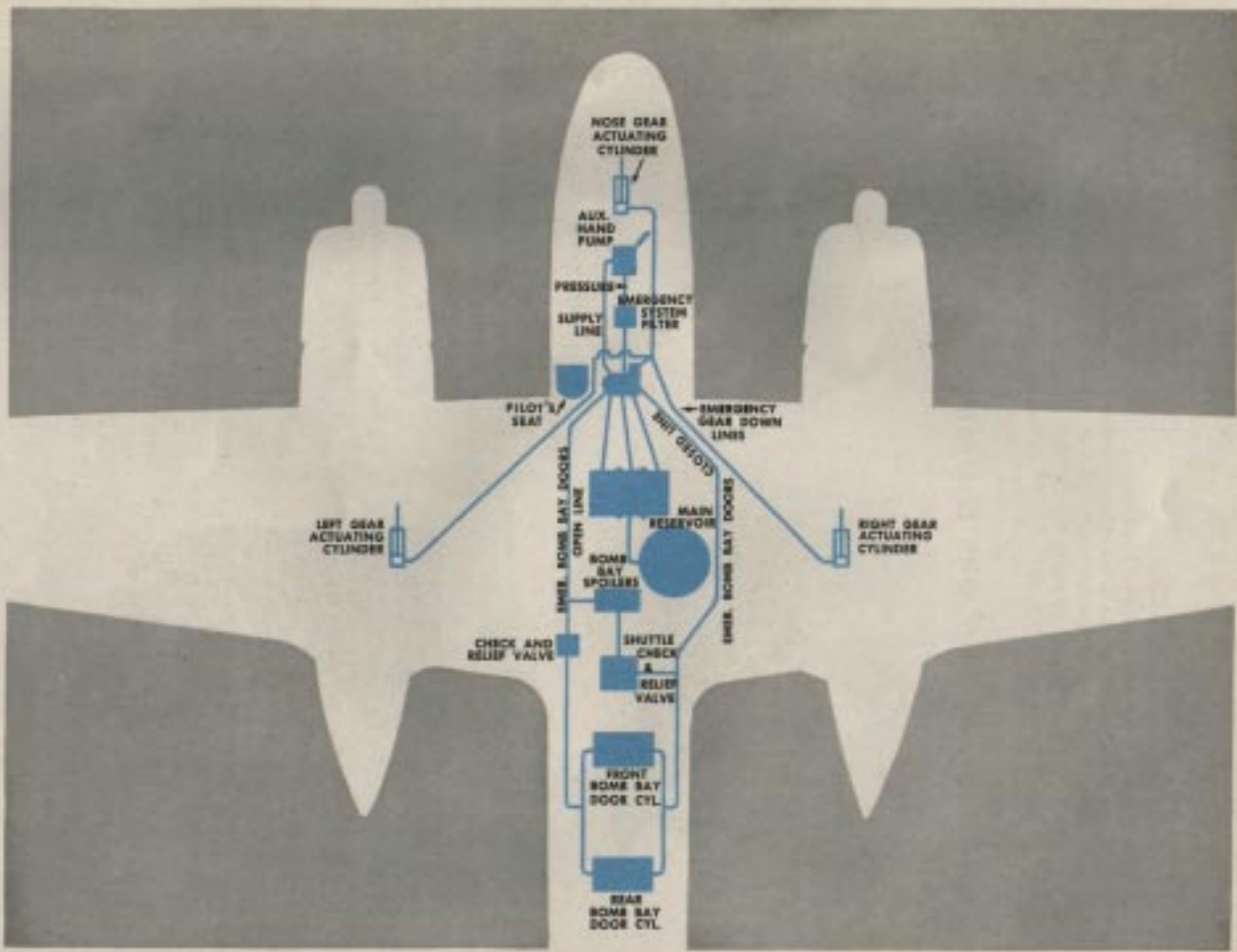
4. Return emergency selector handle to SYSTEM until you require some other operation.

Your main gear extends first. The nose gear does not start down until the main gear is down and locked. If the nose gear does not start down within 6 strokes after the main gear locks, it indicates insufficient pressure to release the up-lock pin. Release this pin manually by pulling the up-lock pin release on the left side of the pedestal, and continue to pump until nose gear is down and locked.

Landing Gear Tips

If you lose your hydraulic pressure and the gage still shows sufficient fluid in the reservoir, the pressure regulator valve may be stuck. Tap it to see if the vibration frees the poppet valve and allows normal hydraulic pressure to build up. Keep your hydraulic selector valve on SYSTEM.

If your gear does not extend because of fluid loss resulting from a broken line, put all your hydraulic controls in NEUTRAL position.



Emergency Opening of Bomb Bay Doors



1. Place bomb bay door handle (or switch on some models) in OPEN position.



2. Place emergency hydraulic selector valve in DOORS OPEN position.
3. Pump approximately 60 strokes with the hand pump until the doors are open. When they are fully open the bomb bay door indicator lamp burns red.
4. Return the emergency hydraulic selector valve control to SYSTEM.

On some models there is a red salvo knob in front of the pilot at the bottom of the instrument panel which, when pulled, quickly opens the bomb bay doors and salvos the bombs in the bomb bay, as well as wing bombs or tanks on the wing racks. In the gunner's compartment there is also an emergency salvo switch which opens the bomb bay doors and salvos the bombs. However, the gunner's switch does not salvo the wing racks. In case of electrical failure, you can open the bomb doors by an emergency lever below the fire extinguisher in the cockpit.

RESTRICTED

Emergency Closing of Bomb Bay Doors

1. Place bomb bay door handle (or switch on some series) in CLOSED position.
2. Place emergency hydraulic selector valve in DOORS CLOSED position.
3. Pump approximately 60 strokes on the hand pump to close the doors. When they are closed the indicator lamp burns green.
4. Return the hydraulic selector valve control to SYSTEM.

Important: When operating emergency hydraulic selector valve from DOORS OPEN position to DOORS CLOSED position, stop at SYSTEM for at least 5 seconds, then continue moving the selector valve to the desired position.

Hydraulic Brake Failure

There is an emergency air brake bottle in the A-26 for emergency braking.

The air brake bottle carries a pressure of 450 to 575 psi, which is sufficient for three separate braking applications. The air brake bottle control has three positions: RELEASE, NEUTRAL, and ON.

To use:

1. Break safety wire.
2. Ease the air brake control slowly back toward the ON position until you feel definite braking action.
3. Release the pressure by pushing the lever forward to RELEASE position and the wheels will roll free. Then apply air again and release.
4. Pull the control to ON and leave it on until the airplane stops.

The third application is your last braking action.

The first two braking actions are to slow the airplane down, to reduce the danger of snapping off the nosewheel, or blowing tires. The third and last braking action is to stop the airplane.

Use caution at all times when applying the air brake. One wheel may grab and lock before the other. If this happens, straighten out your landing roll with rudder and throttle and continue your braking action as needed.

FUEL SYSTEM FAILURE

The A-26 fuel system is dependable and well-designed to supply fuel to either engine in case of operating or combat emergency.

The difference between fuel system failure and a critical emergency lies in your knowledge of the fuel system and your ability to picture

the system mentally and to take the proper steps to offset the trouble.

It is absolutely necessary that you memorize the fuel flow chart.

Study the chart. Set up and solve fuel system failure in your mind.

For example:

You have dropped your bombs, and coming from the target your left main tank, hit by flak, is leaking. Assuming you have used all your fuel except that in the left and right main tanks, what procedure would you follow? **QUESTION**

ANSWER ↓

1. Turn crossfeed bomb bay selector valve On Crossfeed
 2. Switch left booster pump On HIGH
 3. Turn left tank selector valve On LEFT MAIN
 4. Turn right tank selector valve OFF
 5. When the left main tank is down to 50 gallons:
Switch right booster pump On HIGH
 6. Turn right tank selector valve On RIGHT MAIN
 7. Turn crossfeed bomb bay selector valve OFF
- THEN: When left main tank is completely dry, fuel pressure will drop and the left engine will cut out.
8. Turn crossfeed bomb bay selector valve On CROSSFEED
 9. Turn left tank selector valve OFF

ALWAYS TURN OFF BOOSTER PUMPS IF NOT NEEDED

There are only three points to bear in mind:

1. Study the diagram. Know your fuel system so well that you carry a picture of it in your mind for any emergency.

2. When failure occurs, locate the source of trouble quickly. Check to

determine whether it is a broken line, a punctured tank, or a faulty engine-driven pump.

3. Set your selector valve properly and use your tank booster pumps as needed.

Remember

When using your crossfeed selector valve you are cutting out your bomb bay tank supply and feeding fuel from the tanks on one side of the airplane to the engine on the other side.

**FUEL CAN BE SUPPLIED
TO EITHER OR BOTH ENGINES
FROM ANY ONE TANK.**

Engine-driven Pump Failure

In case of engine-driven fuel pump failure, don't forget that you have five booster pumps, one for each tank, that (on HIGH boost only) direct an adequate supply of fuel wherever you want it.

These boosters force fuel from the tank through the selector valve and strainer to the faulty engine-driven pump. As pressure builds up and is unable to pass through the faulty engine pump, a bypass valve operates and passes the fuel directly to the carburetor.

ELECTRICAL FAILURE

Partial or even complete electrical failure does not constitute a serious emergency in the A-26 during daytime flight unless you are on a tactical mission.

Complete electrical failure causes failure of:

1. Guns.
2. Bomb release (except manual salvo).
3. Radio.
4. Compass.
5. Flaps.
6. All lighting equipment.
7. Electrical instruments.
8. Cowling flaps and oil cooler flaps.

Complete electrical failure is rare. If it happens, select the nearest available field with a long runway and make a no-flap landing.

Aside from combat emergencies most electrical failures are caused by an overloaded circuit or a weak connection which pops the corresponding circuit breakers or protectors.

You cannot repair electrical failure in flight but you can insure temporary electrical operation by re-setting the circuit breakers in the cockpit. Once you re-set them in they may stay, or it may be necessary to hold them on for such necessary electrical operation as lowering your flaps, keeping the radio alive, or operating your landing lights.

Check your circuit breakers before takeoff. Check your voltage and amperage. With these checks you will find that the A-26 is virtually free of all electrical system failure.

PROPELLER FAILURE

Hydromatic propeller failure rarely occurs. If you follow the checklist and engine run-up faithfully, you probably never will have propeller trouble.

Although rare, these two troubles can happen:

1. Runaway prop because of congealed oil in the dome. This occurs only in cold weather and is the direct result of pilot error. Guard against it by:

- a. Proper oil dilution.

- b. Proper run-up procedure and prop check before takeoff.

2. Faulty propeller governor lines or mechanical failure.

If propeller failure occurs, retard throttle and alternately press and release the feathering button. If this fails to control the overspeeding propeller, try the prop control at different set-

tings. One of these operations usually brings the propeller under control.

If there is a mechanical failure which you cannot overcome by use of the foregoing procedures, feather the propeller. If the prop does not feather, use the throttle to keep the propeller turning fast enough to avoid drag, continue single engine flight, and land at the nearest field.

Feathering Button Failure

When feathering a propeller, if the feathering button fails to pop out when the prop reaches the full-feathered position, pull it out by hand. Otherwise, the blades go right through the feathering cycle and start to unfeather. Pull out a stuck feathering button quickly if the propeller starts to unfeather; otherwise, you risk engine overspeeding and possible damage.



BAILOUT

CRASH LANDING



DITCHING

When emergencies arise in the air you have little time to think out the action you wish to take. You must know beforehand exactly what to do and how to do it so that you react instinctively and without hesitation.

Practice your emergency procedures on the ground regularly.

Drill your crew until the time element for each procedure is reduced to a minimum.

Plan ahead for emergencies even though your engines are purring smoothly and your airplane is functioning normally. There is no substitute for preparation—ask the oldtimers.

Don't keep a secret! Use your interphone when emergency occurs. Notify your crew at once of the procedure to be used.

If there is any indication of an emergency condition arising, it is only fair to warn your crew in advance so they may be well prepared. If possible, keep them informed at frequent intervals of what is going on, and particularly, of impending impact on crash landing and ditching. Conversation, if used in a normal manner, relieves the tenseness of the situation and promotes clear thinking.

BAILOUT

Pilot Procedure

1. Call crew on interphone to "Adjust parachute and stand by." Have each crew member repeat the call to prevent misunderstanding.

2. Switch on emergency IFF radio transmitter (under green cover guard).

3. Gain as much altitude as possible and slow airplane down.

4. Open bomb bay doors and salvo bombs or torpedoes (to clear exit for rear gunner).

5. Feather both props (to prevent possible injury to bombardier if he bails out through the nose exit).

6. Trim airplane for level flight or a steady rate of descent.

7. Slide seat back.

8. Call crew to "bail out."

9. Release upper escape hatch by pulling emergency handle down hard.

10. Release safety belt. (Hold on firmly as you climb out of seat to prevent wind blast from blowing you out prematurely.)

11. Dive flat (head first) out onto right wing trailing edge. Always bail out in this manner. The downward flow of air passing over the trailing edge of the wing forces you down and under the right horizontal stabilizer, thereby safely clearing the tail section.

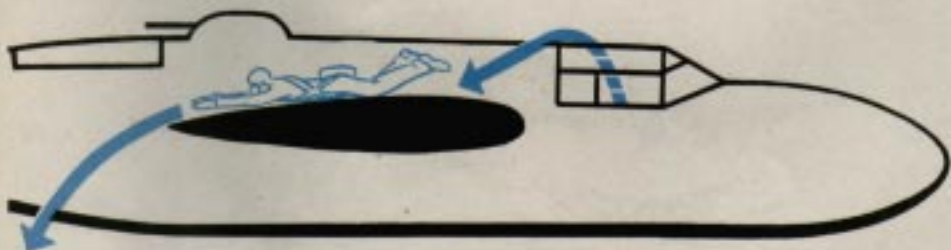
Crew Procedure

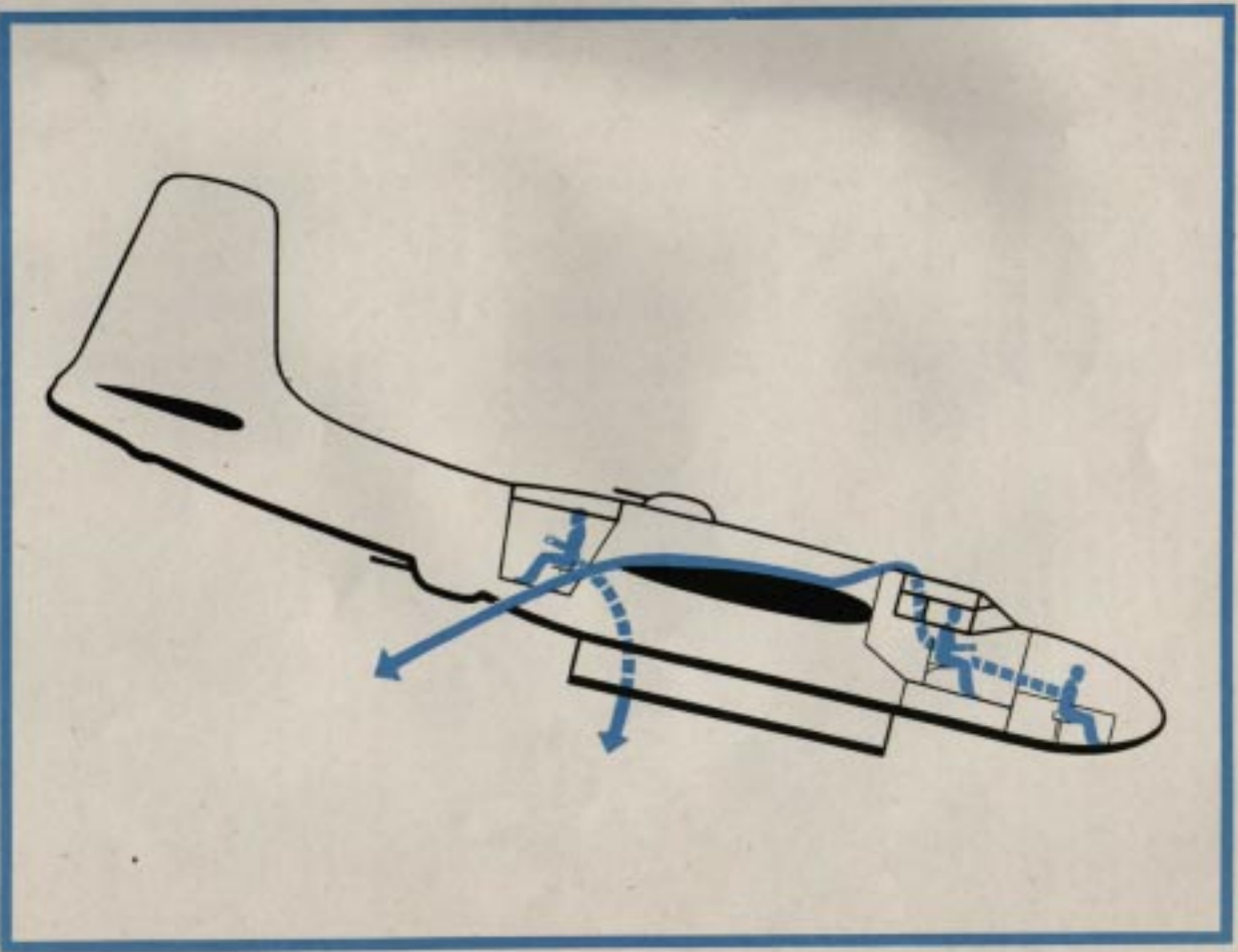
Rear Gunner—Bail out through bomb bay opening.

Bombardier—Exit same as, but prior to, pilot.

Alternate—Bail out through lower nose hatch exit.

Rehearse and re-rehearse this procedure on the ground.





RESTRICTED

RESTRICTED



CRASH LANDING

Pilot

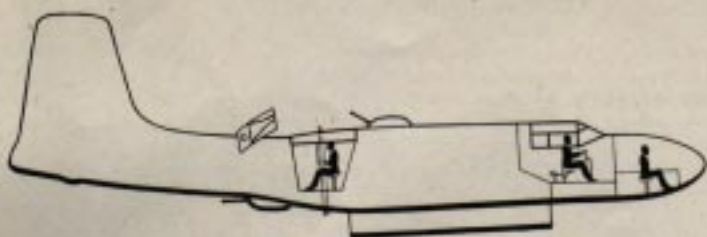
1. Call crew: "Prepare for crash landing." (Have crew acknowledge.)
2. Switch on emergency IFF radio transmitter.
3. Release parachute by unbuckling.
4. Tighten safety belt and lock shoulder harness.
5. Salvo bombs. Close bomb bay doors.
6. Make a normal approach. Use up to $\frac{3}{4}$ flaps. Always make a wheels-up landing.
7. Slide seat back but still keep rudder control. (Place cushion between chest and control column.)
8. Call rear gunner and warn of "final impact."
9. Have bombardier pull emergency lever to release cockpit hatch when airplane is just off the ground.
10. Mixture controls to IDLE CUT-OFF.
11. Turn battery and master ignition switches to OFF.
12. Tank selector valves to OFF.
13. Exit through upper hatch opening.

Rear Gunner

1. Lock upper turret guns in aft position at a 45° angle.
2. Lock sighting station in aft position.
3. Release upper escape hatch by pulling emergency release handle.
4. Unbuckle parachute.
5. Sit on the floor facing aft in the right forward corner of the compartment with back firmly against sloping bulkhead.
6. Brace self with hands and feet.
7. Keep earphones on for pilot warning of final impact.
8. Exit through upper hatch opening.

Bombardier

1. Take up position on jump seat beside pilot.
2. Unbuckle parachute.
3. Tighten safety belt.
4. Pull upper emergency escape hatch release (on signal from pilot).
5. Lean well forward with hands behind head. Use cushion to protect head and face.
6. Exit through upper hatch opening.





Ditching an airplane presents a series of problems which vary under different conditions.

The water surface may be smooth with no wind or swells (difficult to judge height above the surface).

There may be swells but no wind.

The wind may be blowing across, rather than with, the swells. A high wind produces large waves and an extremely rough sea.

While flying over water, more than at any other time, you must plan your course of action while your flight is proceeding smoothly. Don't

wait for an emergency to arise. Remember, you still have to be rescued from the water after you have safely ditched your airplane.

When flying over water ask yourself these questions:

1. Where is the nearest land?
2. Is the wind blowing toward the land?
3. Is the wind blowing with or across the swells?
4. Chances of rescue (after bailout or ditching) by surface ships in the search area?
5. Rough sea—better to have crew jump?

Remember **OPEN WATER USUALLY IS NOT AS CALM
AS IT APPEARS FROM THE AIR**

DITCHING PROCEDURE

Pilot

1. Call to crew: "Prepare for ditching." (Have crew acknowledge.)
2. Switch on emergency IFF radio transmitter.
3. Unbuckle parachute.
4. Tighten safety belt and shoulder harness.
5. Salvo bombs. Close bomb bay doors.
6. Slide seat back but still keep rudder control. (Use cushion for face and chest.)
7. Call rear gunner to "Brace for impact."
8. Make normal approach. Use up to $\frac{3}{4}$ flaps and land with power.

(Ditch while sufficient fuel is available for power.)

9. Have bombardier pull emergency lever to release cockpit hatch when airplane is just off the water.

10. Settle airplane onto water as gently as possible with tail only slightly down. Maintain flying speed until contact.

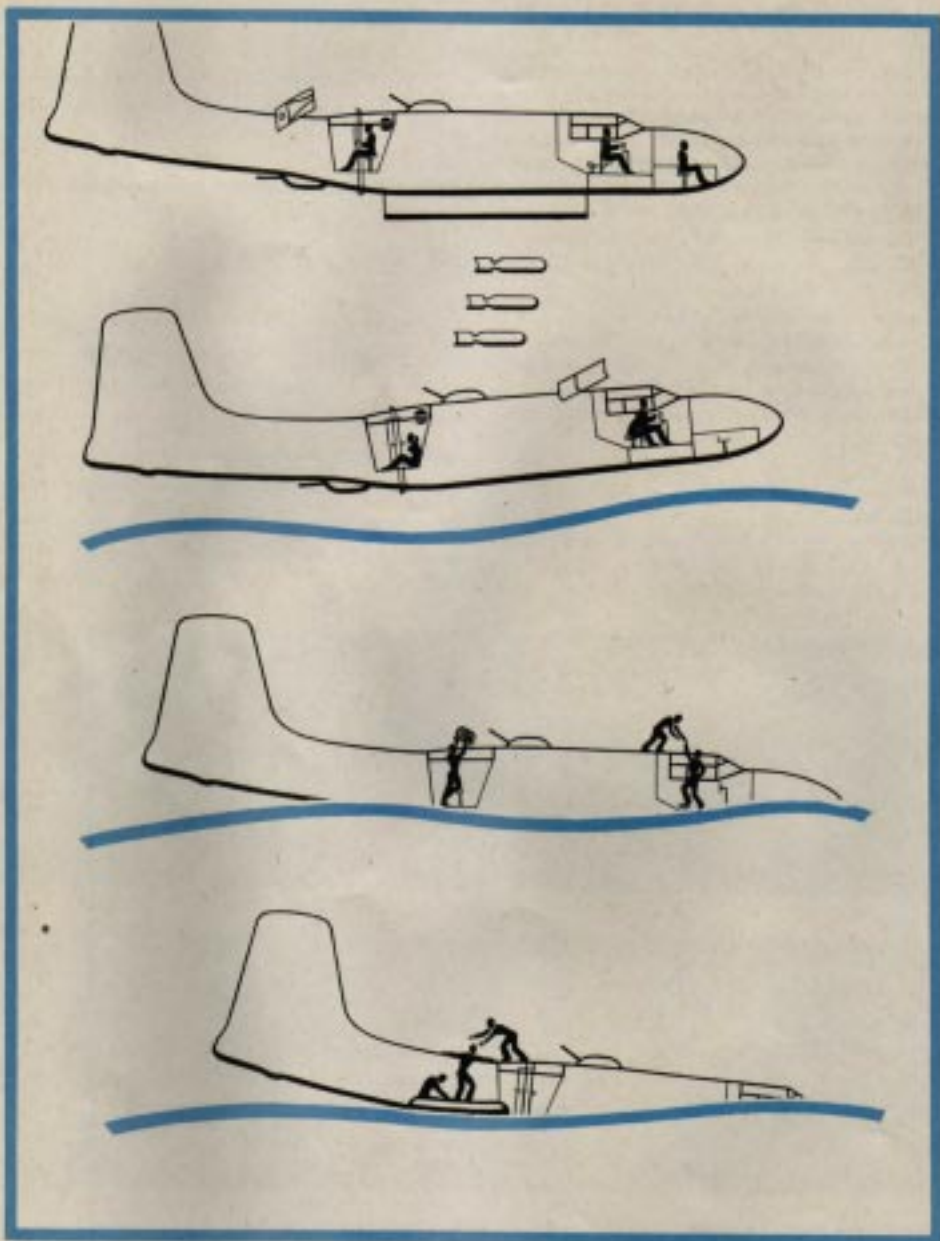
11. Exit through escape hatch and immediately inflate life vest. Proceed aft and assist in inflating and launching of life raft.

Caution

If the airplane alights in the proper (slightly tail-down) attitude, there is a slight impact as the aft fuselage section strikes the water. This is followed by a severe impact with sudden deceleration. (If the landing has been made too fast, a bounce occurs.) As the airplane comes to rest, the nose submerges, but if you have made the landing correctly, the submerging of the nose is minimized.



WAVES (OR WIND) AND SWELLS DON'T ALWAYS MOVE IN THE SAME DIRECTION
RESTRICTED



The airplane can be expected to float for a minimum period of 1 minute. You and your crew must act quickly.

Make your approach and ditch your airplane along (parallel with) the swells—preferably on the upslope of a swell. This may call for crabbing slightly if there is a crosswind.

Be careful to keep a wingtip from digging in.

If the wind is strong (over 35 mph) ditch your airplane into the wind, regardless of the direction or movement of the swells.

Rear Gunner

1. Lock upper turret guns in aft position at a 45° angle.
2. Lock sighting station in aft position.
3. Release the escape hatch.
4. Unbuckle parachute.
5. Sit on floor facing aft in the right forward corner of the compartment with back against sloping bulkhead.

6. Brace self with hands and feet and listen on interphone.

Always wait for final impact before moving out of this position.

7. Pull emergency life raft release and hoist life raft out of compartment.

8. Exit through escape hatch and inflate your Mae West.

Bombardier

1. Take position on jump seat beside pilot.
2. Unbuckle parachute.
3. Tighten safety belt.
4. Pull emergency lever to release cockpit escape hatch (on signal from pilot).
5. Lean well forward hands behind head. Use cushion to protect head and face.
6. Assist pilot from his seat and exit through hatch opening.
7. Inflate Mae West. Proceed aft and assist in inflating and launching life raft.





FIRES

Fire hazard in the A-26 is negligible. Few fires have been reported in training. However, combat operations make your knowledge of fire fighting in flight important.

Besides combat emergencies, fires can be ignited by electric wiring shorting out, or gasoline coming in contact with hot metal parts. There are two types of fires: Gasoline or oil fires, and electric fires.

Fuel or Oil Fire

If an engine catches fire it is a fuel or oil fire.

1. Turn the fuel selector to that engine OFF immediately.
2. Cut mixture control to IDLE CUT-OFF.
3. Close throttle.
4. Feather engine.
5. Turn mag switch off.

6. Close cowl flaps.

If this does not extinguish the fire, sideslip the plane away from the fire if you have plenty of altitude.

Electric Fire

A short circuit can cause fire in the wings or fuselage. If this occurs cut off all light, battery, and generator switches, and sideslip away from fire.

Cockpit Fire

If cockpit fire occurs while in the air, close all windows and shut off ventilators and heaters. Then spray the base of the fire with the CO₂ extinguisher in the cockpit. Most cockpit fires are electrical and burn very slowly. You usually detect them before any great amount of damage is done.

**USE OF THE
AIRPLANE**



AIRPLANE COMMANDER

When you are assigned an A-26 crew, you are much more than just a pilot. You hold a command post and all the responsibilities of a unit commander.

You now have an airplane and a 2-man or 3-man crew for which you are responsible, not only when you are flying or on the flight line, but for 24 hours of the day. Because you have a smaller crew than the medium or heavy bomber, you may think that you have less responsibility. **This is not true.** Actually, your responsibilities are greater, since you have only one or two other men to assist in the care of the airplane. This means that you must know and understand maintenance and operation of each unit in the airplane.

Know the capabilities and shortcomings of each of your crew members. Know their backgrounds, their personalities, and their individual problems. This knowledge enables you to assist and guide them in the training still required to make them specialists in their field.

See that every man is not only thoroughly trained in his own job but understands the other crew members' responsibilities. This develops the harmony demanded of all combat teams.

Be concerned for your crew's welfare. Check to see that they are fully equipped with necessary and modern flying gear. Go to bat for your crew, make sure their parachutes fit, that their Mae Wests are in order, and that they have all the G.I. flying equipment they need.

You cannot over-emphasize the morale effect of neat appearance. Insist on it.

It isn't your job to check the morals and personal behavior of your crew members. But, when lack of sleep or over-indulgence begins to impair their efficiency, it becomes your job.

Remember, your crew depends on you for survival. This means that you must be an expert in every operation of the airplane. As an expert, you will have complete confidence to cope with any situation. Confidence is contagious. When you have confidence, your crew members will not only have confidence in you, but will develop confidence in themselves. Don't forget that confidence should always **follow**, not **precede** knowledge.

Now, about the subject of military discipline.

You are the absolute boss. Use your authority wisely. Don't be a "swell guy pushover." Don't be a Simon Legree. Just be fair—and your crew will respect you and work with you.

REMEMBER

Respect cannot be demanded

It must be earned



FORMATION FLYING

In one year of training in a medium bombardment training unit, the requirements for formation flying have been increased from 5 hours to 30 hours. This means that about 30% of all 2nd-phase training is devoted to formation.

When you consider the amount of bombing, gunnery, instrument work, and navigation to be accomplished, you can see that formation flying is the most important phase in training.

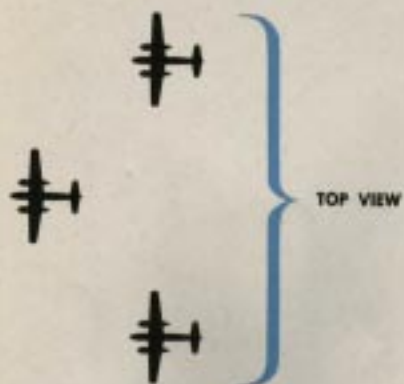
After you arrive in your theater of action, you probably will spend more time learning how to fly formation before you go on your first mission.

If any doubt still exists in your mind about the importance of formation flying, question any combat pilot on the subject.

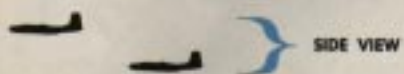
You have a man-sized job to do. Besides actually flying the airplane you need to check your fuel supply, change tanks, check engine instruments, and maintain radio contact with the lead airplane.

If you have another crew member in the pilot's compartment, by all means teach him to observe the engine instruments and fuel supply. But remember, the final responsibility rests with you. Depend on no one but yourself.

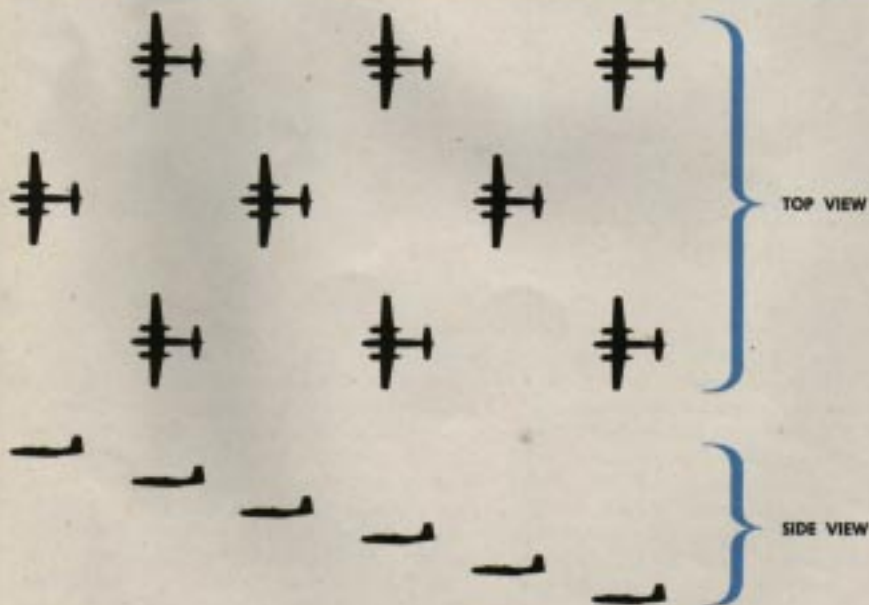
STANDARD FORMATIONS



1. A flight is normally three aircraft. Basic formation for the flight is normally the Vee.



2. A squadron is usually made up of two or more flights. Basic formation for a squadron is normally javelin down formation.



3. A group is made up of two or more squadrons. The basic formation for the group normally is the stagger.

Basic Formation

When a squadron is briefed for a particular mission, a basic formation is selected, depending on the size and shape of the target. Any

other type of formation used on the mission evolves from this basic formation.

THE BASIC FORMATION IS THE ONE RESUMED WHEN THE ROCK WINGS SIGNAL IS GIVEN.

FORMATION SIGNALS

FLUTTER AILERONS: Repeated and comparatively rapid movement of ailerons.



ATTENTION: Used on the ground or in the air to attract attention of all pilots in the formation. Stand by for radio message or further signal. When on ground and in proper position to take off, this signal will normally mean "Ready to take off."

FISHTAIL OR YAW: By rudder control during flight, move the tail of the airplane alternately and repeatedly right and left.



OPEN UP FORMATION: Where applicable, this may be used to order a search formation.

*Keep Your Eye
on Your
Commander*

SERIES OF SMALL DIVES AND/OR ZOOMS



PREPARE TO LAND: An order to each pilot in the formation to prepare to land. In the absence of further signals the landing will be made in the normal landing formation of the unit, which should be predetermined. Any change in formation for landing will be ordered by supplemental signal by radio.

DIP RIGHT (LEFT) WING:

From any formation other than echelon go into echelon of flights to the right (left).

Being in an echelon of flights to the right (left), go into echelon of individual airplanes to the same side. Being in an echelon of individual airplanes, if wing is dipped on the side to which airplanes are echeloned, form echelon of flights to the same side. Being in an echelon of flights or individual airplanes, if wing is dipped on the side away from the echeloned, form same echelon to the opposite side.

ROCK WINGS

Slow, repeated, rocking motion of airplane about longitudinal axis, by gradual use of ailerons.

Wing movement to be slower and of greater amplitude than in "Flutter ailerons."

**ASSUME NORMAL FORMATION:**

From any other formation, go into the normal closed-up formation for the unit concerned. This formation is to be prescribed in each group and/or squadron.

*Rock Wings
Slowly*

Briefing

Never attempt to fly formation until you have been properly briefed. Be attentive at the briefing session. Ask questions regarding anything that is not clear to you. Some small point may be clear to everyone in the room but you. Don't sit in a daze. Don't be satisfied to "almost understand." One bonehead can ruin the entire formation and endanger the success of the mission. Be sure that's not you!

The formation commander tells you everything you should know to complete your mission. Do not leave the briefing session until you know:

1. The basic formation.

2. The number of the lead airplane.
 3. Order of command within the formation.
 4. Your position and number of the airplane you follow.
 5. Number of aircraft in formation.
 6. Signals to be used.
 7. Route and ETA at destination.
 8. Taxi, takeoff, and landing system to be used.
 9. Instrument procedure.
 10. Time to start engines and time of takeoff.
 11. Emergency procedures.
 12. Number and location of the spare airplane.
- Know these things and keep them clear in your mind.

Alerted

After briefing you are alerted. Get your plane and crew ready in the shortest possible time. Be certain that the airplane has been gassed and armed and that the ground check is all completed.

Readiness

Readiness means that you must be ready to hit the blue on 15 minutes' notice. In case your plane develops a last-minute bug and cannot go on the mission, you and your entire crew transfer immediately to a spare airplane which is kept waiting.

Stations

Several minutes before takeoff, "Stations" is called. By this time you and your crew are in the plane, checklists completed, engines started, and hatches closed. You are ready to taxi out to your position for takeoff.

Takeoff and Assembly

You are given a takeoff interval during briefing. Understand clearly when and how to time this interval. Don't jump the gun. It makes your own assembly more difficult and messes up the timing of all the planes behind you.



Alternate in the use of the runway.

The first plane takes off on the downwind side, the second on the upwind side, and the

third directly in line with the first. This is done to help cut down the effect of prop wash.

The leader takes off and climbs straight ahead for a period of time determined by the number in the formation. Individual planes in the formation take off at 20-second intervals. Each succeeding pilot begins his turn 10 seconds after the airplane ahead of him has started to turn. Your formation leader maintains a constant $\frac{1}{2}$ needle-width turn, a constant airspeed and rate of climb. Knowing these (you were told at briefing) you can govern your own airspeed so as not to overtake him too suddenly or join too far behind.



Plan to head him off as he comes out of his turn. Aim for where he will be, not where he is.

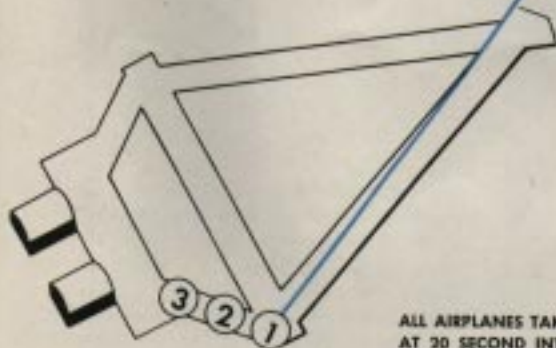
Do not attempt to shorten your flight path so much that you approach him at a 90° angle. This is dangerous.

Always keep the lead airplane in sight. If you know his speed to be 170, don't join the formation at 200—you will overrun him.

FORMATION TAKEOFFS



- 1 Lead airplane flies straight out for one minute + 20 seconds for each airplane, then makes a 180° half-needle width turn.
- 2 10 seconds after lead airplane starts to turn, the second airplane starts its turn, keeping the nose ahead of the leader, pulling into position from below and behind the leader's OUTSIDE wing.
- 3 10 seconds after the second airplane starts to turn, the third airplane starts its turn, keeping the nose ahead of the leader, pulling into position on the leader's INSIDE wing.



ALL AIRPLANES TAKE OFF IN THE ORDER OF JOINING FORMATION AT 20 SECOND INTERVALS (TIMING FROM THE MOMENT PRECEDING AIRPLANE OPENS THROTTLE TO START TAKEOFF RUN)



Position in Formation

Your position as wingman in close formation is $\frac{1}{2}$ wingspan out from your leader and $\frac{1}{2}$ fuselage length back from your leader. Fly just low enough so that your engine nacelle does not block clear vision of the lead airplane.

After you have established this position, hold it. Holding position is the test of a good formation pilot.

To hold good position:

1. Be alert.
2. Anticipate your action to stick with your leader. This means:
 - a. When your leader turns into you, reduce power momentarily to hold position and re-apply as needed.
 - b. When your leader turns away from you, promptly apply power as needed.
 - c. When your leader starts a climb, be alert. Increase rpm and manifold pressure.

Don't straggle. The lessons you learn now may save your life in combat. The enemy waits for stragglers.

Common Errors of Wingmen

Check yourself against these common errors:

1. Making throttle adjustments too radically.

2. Applying trim improperly.
3. Failing to anticipate the movements of the leader.
4. Flying with one wing low.
5. Taking eyes off the leader for too long a period of time. (Glance at one instrument at a time. Don't keep your head in the cockpit.)
6. Using too high an rpm setting for continuous cruise. (Use higher rpm only when maneuvering in formation.)
7. Failing to remember signals.
8. Being too tense.

Cross-Under

Do not take the term "cross-under" literally. You never actually cross under another airplane; you drop down and back slightly to clear the other airplane safely.

In moving into echelon formation, retard your throttle momentarily and drop down (about 50 feet) below your leader and back far enough to clear the wingman safely, keeping your leader and the wingman in sight at all times. As you make a coordinated bank to move into the echelon position, anticipate the need for additional power. Always know the position of the other planes near you.

Always make cross-unders with smooth, deliberate movements.

Formation Landing Procedures

The following is the normal A-26 landing procedure. However, variations of this procedure may have to be adopted because of terrain features, obstacles near the landing field, or weather conditions.

Formation landing procedure in your training is as follows:

The squadron leader, having obtained permission to land the formation, brings it over the landing runway in javelin down formation. The lowest airplane should be at traffic altitude. The airspeed of the leader should be 200 mph.

The leader gives the landing signal when he reaches a point approximately $\frac{3}{4}$ of the way down the landing runway. When the leader is opposite the end of the runway, he begins a $\frac{1}{2}$ needle-width turn toward the downwind leg.

The other flights keep their original heading. Each flight leader begins his turn exactly 45 seconds after the turn of the preceding flight.

The lead flight continues its turn towards the downwind leg. When it reaches a point 90° from the downwind leg, the inside man, without any signal from the leader, crosses under and assumes echelon formation. Do not start the cross-under before reaching the 90° point.

The leader of the first flight continues on a course 90° to the landing runway until he turns on his downwind leg. Each succeeding pilot of the flight turns onto his downwind leg at 15 second intervals.

Each succeeding flight follows this procedure at 45-second intervals.

The leader of the first flight peels off on to a normal base leg. Each succeeding airplane turns onto the same base leg. This provides a 30-second interval on final approach.

The leader lands on one side of the runway, and each succeeding airplane lands on the opposite side from the plane in front of it. This eliminates prop wash.

Each succeeding flight repeats this procedure.

The success of formation landing depends upon exact timing and constant airspeed. Any errors you make along the way are transmitted and magnified back to the last airplane to land.

Critique

In combat the critique is the detailed review of the entire mission, success over the target, the number and types of enemy fighters encountered—in short, all information of the mission.

The critique is also the bitch session. This is where the boys let you have it. Everybody honestly airs his questions and gripes. Be attentive! Prove that you can take it. You learn plenty in critiques. It is important in that it helps eliminate future mistakes.

Formation Leader

Leading a formation is a great responsibility. The success of an entire mission is in your hands. Remember, your wingmen can be no better than you are.

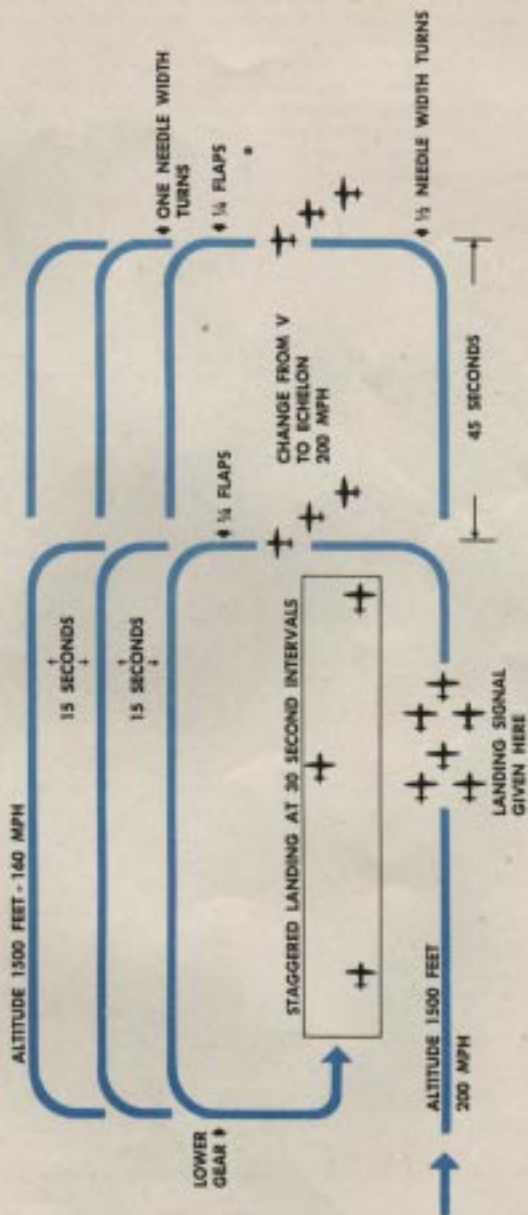
Good formation depends on good leadership; good leadership depends on smooth, precise flying.

To be a good leader:

1. Follow the briefing instructions exactly. If you are to climb your flight at 200 mph at 500 feet per minute, **do so exactly**. This gives your wingmen confidence in your leadership.
2. Make all your turns smooth and constant.
3. Make your signals definite, but don't overdo them.
4. Demand and insist upon strict radio discipline. Your radio transmissions must be clear and brief. Tolerate no unnecessary radio chatter.
5. Always consider your wingmen's problems. They must constantly change throttle settings in maneuvering, and consequently their fuel consumption is higher than yours.

**IT IS A WELL-KNOWN FACT THAT THE COMBAT GROUPS
WITH THE FEWEST LOSSES FLY THE BEST FORMATIONS.**

FORMATION LANDING PROCEDURE





The A-26 carries a bomb load equivalent to that of a medium bomber. The design of the airplane and the all-purpose nose signify the different types of bombing this plane is equipped to do. Since you have a complete description of the bombing equipment in the armament section, this section adheres to operating instructions and procedures.

The pilot drops the bombs except when the bombardier nose is installed. Therefore, you must not only understand the bombardier's problems, but you must know how to operate all the bombing equipment yourself.

Loading the bombs plays a big part in a successful bombing mission. One faulty bomb station, or one that is only half cocked, may prevent all of the bombs from being dropped. It is your responsibility to check each bomb sta-

tion by running through the racks before loading the bombs.

Do this:

1. Turn on battery switches.
2. Open the bomb bay doors.
3. Put racks on SELECT.
4. Cock each station.
5. Turn on rack switches.
6. Then fire each station by the bomb release button while your gunner watches the stations.

Also check the indicator light panel for burned-out bulbs or defective wiring while checking the stations. Each light on the panel represents a bomb station. When the station is cocked, the light burns if the panel light switch is held on and the bomb bays are open. These

Warning Never hold panel light switch on during actual release or bombs will be dropped **SAFE**. (Some airplanes do not have indicator light panels.)

lights go out as their respective stations are fired.

Then Check the Intervalometer:

1. Put racks in the TRAIN position.
2. Set large intervalometer dial to desired spacing of releases.
3. Set the small dial to the number of bombs to be dropped.
4. Set intervalometer switch to TRAIN.

Be sure that the bomb bay doors are opened fully (note indicator lamp) before making a rack selection of SELECT or TRAIN. After cocking the stations, push the bomb release button once and the intervalometer fires all the stations.

5. Turn off battery and all bombing switches.

When you are satisfied that the stations of each bomb rack are operating O.K., cock the stations again. Then proceed to load the bombs. If heavy bombs are used, you need the bomb hoist equipment stowed in the right nacelle. You can use this equipment to load either the bomb bay or wing racks.

Releasing Bombs

If you are flying a plane with the bombardier nose, your bombardier releases the bombs. However, it is your responsibility to have the pins pulled, the bomb bay doors open, and the racks set in the position required.

Select

If you are flying wing position and dropping on the lead plane in single releases, it's your responsibility to:

1. Have pins pulled (as soon as you are in formation).
2. Make sure (by indicator light) that bomb bay doors are fully opened (with lead plane).
3. Set racks on SELECT.
4. Set arming selector switch on ARM position.
5. Set nose and tail selector as desired (not necessary on practice bombs).
6. Select DEMOL or FRAG position.

Train

For bombing in train the same operations must be followed, except that you set the racks

in TRAIN position instead of SELECT position, and you set the intervalometer before takeoff for spacing between bombs, number to be released, and the TRAIN position. It may be necessary to change interval dial setting as changes of ground speed may be encountered. Know the position of each switch so that you can complete these operations while keeping formation.

Bombing Tips

Know which of these operations you can complete on the ground without danger on takeoff.

When bombing in TRAIN, these two switches must be:

1. Rack switch on TRAIN.
2. Intervalometer switch on TRAIN.

Salvo

The other method of releasing bombs is salvo, and you usually use it in emergency. Salvoing is done on some of the early series by means of the bomb bay door lever by the pilot's left leg. First pull it back to the OPEN position. As soon as the doors are open, pull it farther back to the SALVO position. This mechanically releases the bombs in the bomb bay and on the wing racks. You also can salvo wing bombs by an electrical wing salvo switch. On later-series airplanes you can open the bomb bay doors by an electric switch on the upper right corner of the indicator light panel. The bombs are salvoed mechanically by pulling the red plunger on the bottom of the panel directly in front of the pilot.

Types of Bombing

Synchronous bombing is usually done in the A-26 at altitudes from 7,000 to 15,000 feet. This kind of bombing requires the utmost cooperation of the pilot and bombardier and cannot be successful until the pilot understands the problems of the bombardier.

The two most important pilot responsibilities of the bombing run are:

1. First and most important is constant airspeed, which is agreed upon during briefing.
2. Next in importance is constant altitude, also agreed upon during briefing.



With these two factors known, the bombardier can pre-set his trail into the bombsight. Trail is the distance the bomb lags behind the airplane at the time of impact. Flying at an altitude of 10,000 feet, if you are flying 5 mph faster than the prearranged airspeed for which the bombsight is set, the bomb falls almost 200 feet short of target. A difference of 100 feet too high, even though the airspeed is correct, would cause the bomb to hit about 65 feet beyond the target. From these examples you can see that airspeed is the most important factor, and altitude is next in importance. It is easy for a good pilot to keep them both exact.

With altitude and airspeed being held constant, the next problem is deflection, or course.

Pilot's Directional Indicator

The pilot's directional indicator (PDI needle) tells the pilot the course correction set in the bombsight by the bombardier. Keeping the needle in the center means keeping the plane on the bombsight course. The changing of the needle to one side doesn't necessarily mean a correction by the bombardier; it may mean that you are letting the plane point off the true course.

Another factor which affects your course is crosswind, which causes the bomb to drift after it has been dropped. This is corrected by the bombardier by flying a parallel course on

the upwind side of the target. This correction for drift effect is known as **cross-trail**.

It is the pilot's responsibility to fly the airplane straight, level, and steady at the point of bomb release. Lurching or skidding of the plane throws the bomb several hundred feet off.

Bombing Run Procedure

Many dry runs are caused by misunderstanding the signals between you and your bombardier. Your procedure should be the same on



all runs so that all operations can be anticipated. Plan ahead with your bombardier so that you understand when the bombardier wants his different levels and corrections.

When turning from the initial point (IP) help the bombardier by leveling out on a straight line to the target. Practice this until you can recognize and kill drift. Your bombardier can be no better in his job than you are in yours.

When leaving the IP and starting your run:

1. Open the bomb bay doors and maintain constant bombing airspeed and altitude.

2. The bombardier immediately requests "Stabilizer level." Hold the plane in a straight and level attitude. This **absolute level** of the plane is extremely important, because if the leveling bubble is off even half a bubble it causes a larger error than faulty altitude or airspeed. Acknowledge bombardier's request for level **only when plane is level**, not when it's almost level or when you think it soon will be.

3. Hold this level until the bombardier says "Level complete." Check your course again and give the bombardier "On course," which he acknowledges.

After that you get your first PDI correction. The first corrections are the largest. The PDI is extremely sensitive. From center to full right or left means only a 5° turn indicator change of course. Make these first corrections smooth and coordinated, with never more than a 10° bank. After you have the course straight with PDI centered, note the heading on the turn indicator. Hold this heading. At the same time, constantly refer to the PDI needle for further corrections.

If the PDI needle moves to the right, bring it back to center by a small correction to the right. Hold the new turn indicator heading. Continue these corrections until your bombardier is fat, happy, and on course.

All during this run you have been holding a constant airspeed and altitude, and you now

have a true course. Approximately 10 to 15 seconds before the bomb is released, the bombardier calls for another level. Check for level flight. Make certain the airplane is level, and acknowledge at this time. Your bombardier is taking a bubble level which sets the bombsight gyro level. Again he says "Level complete," and you acknowledge with "Back to PDI."

Soon after this the bomb is released, so don't make large corrections. When the bomb is dropped the bombardier calls "Bombs away." After caging his gyro, the bombardier advises "O.K. to turn." Do not turn off before this O.K. It may cause material damage to the delicate bombsight.

The foregoing procedure seems long, but it can be accomplished in 40 seconds with practice. The first runs take as long as 2 minutes, but familiarization and anticipation reduce this time to a minimum.

Take into consideration your wind drift so you can set up an initial course that requires little PDI correction. Always check with the bombardier so that he does not clutch in the sight until he has the course hair lined up. If there is a crosswind that you have already corrected for, and he clutches in the sight before lining up the course hair, he takes your drift correction out to set the course hair on the target. Then he has to turn it back again to set in a new crab. This is done within the bombsight itself and causes a reverse correction on the PDI.

ALWAYS HAVE THE BOMBARDIER LINE UP THE COURSE HAIR BEFORE CLUTCHING IN THE BOMBSIGHT.

To use this method successfully, you must line up the plane within 10° of bombing course.

Bombing From Wing Plane

Bombing from wing position in the A-26 means a dual job for the pilot. You must fly a good formation, and also release the bombs.

Memorize the position of all the bombing switches so you can operate each one as you hold your position in formation. Set the intervalometer before takeoff.

You must accomplish the following in formation:

1. Open bomb bay doors at the same time the lead ship's doors open.
2. Set racks (either SELECT or TRAIN position).
3. Arming selector in ARM position.
4. Type bomb switch either FRAG or DEMOL.
5. NOSE AND TAIL switch set as desired.

Then concentrate on lead plane so that you can drop bombs instantaneously with it. Be ready to operate bomb bay doors at the same time as the leader to make formation position easier to maintain.

Skip Bombing

Successful skip bombing depends on flying skill and knowledge of setting the dropping

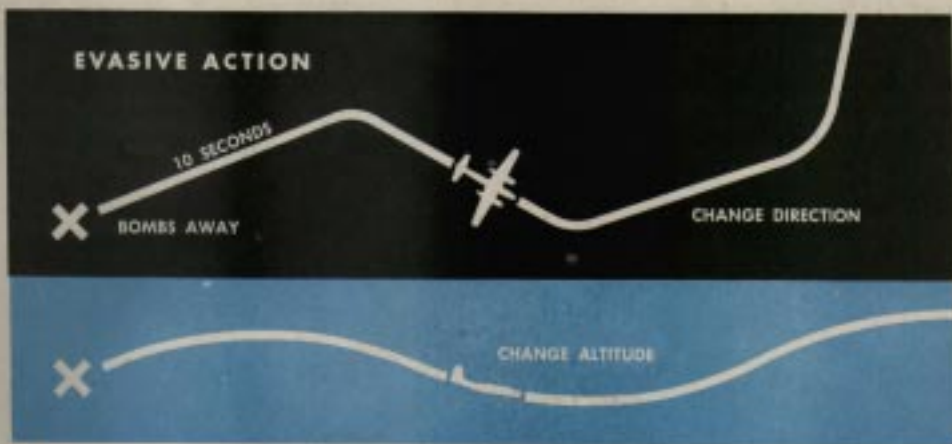
angle in the N-6A gunsight. This angle is set according to airspeed and altitude, computed on a chart used with the N-6A sight. Skip bombing is usually done at altitudes from 50 to 300 feet. Contrary to popular belief, skip bombs should be dropped for direct hits, preferably the base of the target—for example, the waterline of a ship. Remember: Unlike synchronous bombing, altitude is a more important factor than airspeed in skip bombing.

Line up with the target and go in extremely low, with evasive action if necessary. About 5 seconds before releasing the bomb, bring the plane to proper altitude and hold on straight and level course (check needle-ball). It is necessary to keep the airplane in this position for only a few seconds before bomb release. Looking through the sight the circle and dot pass over the surface and over the target. Anticipate actual pressing of the bomb release button to reduce the personal lag error. A large error results if the plane is diving or climbing at instant of release. Always lead a moving target slightly or make arbitrary corrections for a crosswind.

Here are examples of the importance of altitude in skip bombing. The sight is set for 250 mph and 100 feet altitude.

Example 1.	Airspeed 330 mph	Altitude 100 feet	
	Airspeed (Correct)	Altitude 135 feet (35 feet too high)	Error 115 feet short of target
Example 2.	Airspeed 260 mph (10 mph too high)	Altitude correct (100 feet)	Error 25 feet beyond target





Combat Bombing

Combat bombing, usually done in formation, is divided into two types:

Precision pattern bombing, and area bombing.

Precision bombing means placing the bomb on a specific target by a precise synchronous sighting operation.

Area bombing means placing a number of bombs in a given area and probably will not be used much in the A-26.

Evasive Action

When you gotta zig . . . you gotta zag!

The purpose of evasive action is to prevent the anti-aircraft gunner from predicting the position of your airplane at the time his projectile reaches its point of detonation. To avoid being a cold turkey you must understand the anti-aircraft gunner's operations. It takes approximately 15 seconds for the ack-ack gunner to estimate your altitude and airspeed, and cut fuses to get his projectile into the air. It takes one second for each 1000 feet of travel through the air. Knowing this, you can see why it's advisable to hold a straight course for approximately 10 seconds, then change course. This causes the enemy gunners to set up a predicted aiming point, and it gives your formation

enough time to move to a new heading before the projectile reaches point of detonation. When flying evasive action, consider the men trying to stay in formation with you.

1. Make your changes in course a smooth maneuver but in plenty of time to get the rest out of range.
2. Make these turns not over a 15° bank, but make at least a 30° change of course.
3. The change of altitude is almost as effective as the change in course, so coordinate the change in course with the change in altitude all during evasive action.

Where Evasive Action Is Not Used

Under certain conditions evasive action is sometimes impractical.

At the discretion of the theater commanders, evasive action may or may not be used. It has been found that in certain heavily defended areas where the enemy anti-aircraft tactics are to lay a solid curtain of flak, losses are lighter when the formation uses no evasive action, but bores right through the anti-aircraft fire in straight and level flight.

The reason for this is that the formation enters and passes through the heavily defended area more quickly, and consequently is exposed to enemy fire for a shorter period of time.



GUNNERY

No other plane in the Army packs the forward firepower of the A-26. It is designed, among other uses, for low-level attack and strafing. You must know the location of all your gun switches, how to load your guns, and the principle of air-to-ground gunnery.

All the guns must be loaded and charged while on the ground. Under most circumstances, you don't have to do this yourself, but the time may come when knowing how to load your gun will save your life. See your armament officer for this information.

When you charge your guns, be certain that the airplane is pointed where there is absolutely no danger of hitting anything or anyone in case of an accidental firing (preferably a gun abutment).

Air-to-ground Gunnery (Fixed)

For air-to-ground fixed gunnery, considerable skill is required. Here are some points:

1. Know and abide by all the range rules.
2. Have good radio contact and guard the range control throughout the entire mission.
3. Set your rpm at about 2200 and use throttles as needed to hold airspeed.
4. Turn on your gunsight and adjust it to 0° elevation.
5. On your fire control panel, switch your top switch on GUN AND CAMERA.

Now set up your pattern, which in most cases is an ordinary rectangular pattern at 1,000 feet. Make a few dry runs on the target with your actual approach path at about a 40° angle with the ground. On these passes, trim your plane up so that at the time you normally would be firing (1000 to 500 feet from the target), the needle and ball are centered exactly. Your airspeed at the time of firing will be between 260 IAS and 280 IAS. From the accompanying illustration, you can see why it is necessary to center the needle and ball.

RIGHT



WRONG



RESTRICTED

When using the gunsight, keep both eyes open. When you have accomplished the foregoing procedure, you are ready to fire. Do not turn on the FIRE CONTROL switch on the fire control panel until you have rolled out of your last turn and are lined up with the target.

Then put the bead on the target with coordinated use of stick and rudder. Once the bead is on the target, freeze on the rudder and make last little corrections with the aileron. Above all, hold the rudder steady while you are actually firing. Fire short bursts of no more than 20 continuous rounds per gun.

Correct for wind drift by dropping a wing into the wind, but keep the ball in the center.

Pull out well over the target, because bullets and dirt ricochet and may possibly come back through the windshield.

As you chandelle up off the target, your first duty is to turn off the FIRE CONTROL switch on the fire control panel.

Don't be afraid to make plenty of dry runs, and don't waste ammunition.

Air-to-ground Strafing

Strafing differs from target gunnery in that you fly to your target at a low level and pull up and dive on the target to strafe. Make no effort to keep the ball in the center or to hit any one particular target.

The firing procedure is the same, but you use the sight for range only. As you fire, take your eyes off the sight and watch the targets.

Gently fan your rudder enough to cover the width of the targets with your fire. Here again, make your bursts as short as possible.

Do not make your approach too flat, or your bullets tend to go over the target.

Air-to-air Fixed Gunnery (Tow Target)

Remember these simple rules.

1. Do not turn on the FIRE CONTROL switch until you are ready to fire.

2. Be certain that the tow-target plane is not lined up with the target.

3. As soon as you have made your pass, turn off the FIRE CONTROL switch.

4. Always maintain radio contact with the tow-target plane.

5. Study gunnery manual on how to lead or trail the target.

Flexible Gunnery

During your fixed gunnery, the only person over whom you had to exert control was yourself. In flexible gunnery you control your fire through the rear gunner. This means that you need the ultimate in air discipline.

Instill this into your gunner. Insist that he wear his headset at all times. Make your radio and interphone communications as brief and concise as possible. Never take off until your gunner understands his duties thoroughly and is fully briefed on how the mission is to be run.

Learn your gunner's problems by having a hull session upon the completion of each mission.

Air-to-ground Flexible Gunnery

Fly your pattern to give your gunner good, clear shots. Watch your tell-tale indicator. Know at all times where the gunner is tracking. Teamwork is the road to success.

Air-to-air Flexible Gunnery

Proficiency in air-to-air flexible gunnery is your insurance against enemy fighter opposition. Air discipline and teamwork is the secret.

Have the gunner call off the position of the other plane in terms of the clock system, "3 o'clock low," "6 o'clock high," etc. Camera guns are used in air-to-air gunnery to check your gunner's marksmanship, and your job is to follow your leader in good formation while the "enemy" planes make passes.

On every mission you and your gunner must be constantly searching the sky for other aircraft. Get into the habit of calling their position off to one another at all times during flight. The gunner should track these "enemy" aircraft, with empty guns only, to gain proficiency.



The importance of your ability as a pilot-navigator cannot be over-emphasized in the A-26. In the models with a bombardier nose, your bombardier doubles as a navigator, but

even then you need to be a good navigator yourself. Navigation is not the tough problem it's cracked up to be. It amounts to only two things: Preparation and procedure.

Preparation PLOT AND PLAN YOUR FLIGHT IN DETAIL

KNOW: Distances • Headings • Altitudes

Alternate destinations • Time of departure •

Estimated time of arrival • Methods of

navigation • Fuel consumption •

MOST NAVIGATION BALL-UPS ARE CAUSED BY

INSUFFICIENT PREPARATION.



Know Your Weather

Take the initiative. Ask the weather man.
 Know the winds aloft, and immediate and
 forecast conditions along your route.

Have Your Equipment

Do not try to navigate without all necessary navigational aids. Be sure you have:

- Time and distance computer.
- Sectional and regional maps.
- Radio facilities chart.
- Pencils.
- Log forms.

Procedure

There are three types of navigation:

1. Pilotage.
2. Dead reckoning.
3. Radio navigation.

Depending on the type of your mission, you lean heavily on one of the three main methods of navigation. **But you seldom use one type to the exclusion of all others.**

Always check yourself while navigating by using all three types of navigation.

Pilotage

In combat zones, where there are few radio aids, most of your navigation depends on pilotage and a combination of pilotage and dead reckoning. Over-all terrain features become increasingly important in a fast airplane. Learn to recognize outstanding terrain features quickly and accurately.

Make certain that before you take off you have plotted your course and have clearly marked your check points at regular mileage intervals. Log your time of departure accurately; approximate your ETA to your first check point and watch closely for it. This way you can determine your groundspeed and accurately figure ETA's for each succeeding check point. Figure and write down your groundspeeds at each check point. **It is easy to forget—but it's easier to write it down.**

As you progress on your course, observe to



which side of course you are drifting. Correct for drift immediately before large drift corrections are necessary. You must be doubly alert on low-level missions. Flying at high speed at low altitude is a challenge to your pilotage. You've got to be on the ball all the time.

Watch your fuel gauges even more closely during low-level navigation. Treetop level is not the place to run a tank dry.

Dead Reckoning

Dead reckoning is the backbone of navigation. It depends on the accurate use of your magnetic and directional compass. The same cardinal rule holds in dead reckoning as in all other types of navigation. Before takeoff, prepare—prepare—prepare!

The procedure is simple. Hold your course and altitude constant. Fly out your ETA. Remember altitude and temperature when computing true altitude and airspeed. Check every range station for winds aloft at your flight altitude.

Don't fight with your airplane. Keep it trimmed so it flies hands-off and you have plenty of time to make log entries and plot fixes. Watch your fuel consumption carefully.

Contact every range station, giving your position and asking for weather along your route. If you get into trouble Flight Advisory Service

will call you and advise a way out. Don't wait for this emergency call based on your failure to arrive at your destination or your failure to check in at the range stations en route. Call Flight Advisory Service through your nearest range station if you are in any difficulty and they will, within a few minutes, find the answer to your question, whatever it may be.

While flying dead reckoning, don't neglect to make necessary drift corrections every time you make a change in course.

Radio Navigation

Outside combat theaters, radio navigation is your most important aid in navigation of the A-26. It is possible to navigate an entire training mission on radio alone, but it is wise to cross-check yourself with pilotage and dead reckoning.

Preparation is still the most important factor. In addition to noting weather, check points, and danger areas, make certain you have the latest corrected radio facilities chart.

Always remember that you cannot always depend on radio navigation. Violent electrical disturbances or radio failure make your log on dead reckoning and pilotage important. In bad weather, when you need your best navigation, your radio is the first to desert you.

There are four basic methods of using the radio compass. In any case, turn the jackbox marked VOICE, RANGE, BOTH to the BOTH position. Turn the other jackbox for maximum volume. Turn the selector switch on your jackbox to the radio equipment you want to use (in this case to the COMPASS position).

While you fly your course you will want to take radio fixes to determine your exact position. Fixes can be taken with either compass or loop.

Compass Fixes

Fixes are established by taking three bearings. Select three nearby stations with at least one on each side of your course. Look up their frequencies in the radio facilities chart and tune in your first station, writing down the time you take your first bearing. Make certain you are holding a constant course as you follow the procedure given here.

USE ONE OF THE FOLLOWING PROCEDURES FOR THE TYPE OF RADIO COMPASS IN YOUR AIRPLANE:

AN/ARN-7 TYPE RADIO COMPASS

1. With radio compass on ANT, tune up the station until you can positively identify it by its call letters.

2. Switch your radio compass to the COMPASS position. (The arrow on the dial points to the station you have tuned.)

3. As your needle points to the station, take a reciprocal reading (the opposite end of the needle). Add your reciprocal reading to the true course of the airplane. This is your station-to-plane bearing.

Important: If the sum of the compass reading and the true course of the airplane is more than 360° , subtract 360° from that total to arrive at the station-to-plane bearing.

4. Write this bearing down and repeat Steps 1 through 4 for the other two stations. These three bearings give you a position fix.

NM-26 V TYPE RADIO COMPASS

1. Rotate the needle to 0 on the compass azimuth control.

2. With radio compass on ANT, tune up the station until you can positively identify it by its call letters.

3. Switch your radio compass to the COMPASS position. (Note that the left-right indicator swings toward the station.) Control the sensitivity of your indicator needle with the compass knob on the face of the radio compass.

4. Rotate the needle on the compass azimuth control to the right until the left-right indicator centers itself from the left. (This always gives your position from the station to the airplane.)

5. Add this reading on the compass azimuth control to the true course of the airplane and this is the station-to-plane bearing on the station being tuned.

Important: If the sum of the compass azimuth control reading and the true course of the airplane is more than 360° , subtract 360° from that total to arrive at the station-to-plane bearing.

6. Write this bearing down and repeat Steps 1 through 6 for the other two stations. These three bearings give you a positive fix.

Take all three bearings quickly but accurately and remember that you must hold a constant heading while you are taking your bearings to establish a true fix.

When you have the three station-to-plane bearings, plot them on your map. They will form a small triangle, the center of which is your position, or fix, at the time you took your first bearing. Allow for time elapsed on course. Always think of your fix as being where you were when you took your first bearing, instead of where you are when you complete all three.

The faster you take accurate bearings the less error (smaller triangle) you have. At 240 mph you travel approximately 8 miles in only 2 minutes.

Loop Fixes

During extreme static conditions it is almost impossible to control the sensitivity of the left-right indicator on COMPASS. When these conditions prevail, use the LOOP position on your radio compass to take bearings and establish your fix. This loop method is known as an aural null fix.

You can recognize this null by the complete fade in signals, the narrowness of the signal in degrees on the dial and the fact that you get an aural null, or fade, at 180° reverse positions. You follow the same procedure in the LOOP aural null fix.

Pick three stations with at least one on each side of your course. Be certain that you hold your heading accurately while you are taking your bearings.

Look up the frequency of the stations in the radio facilities chart and always write down the time you take your first bearing. Work quickly and accurately.

1. Rotate the needle to 0 on the compass azimuth control (if NM-26V type radio is used).
2. With the radio compass on REC ANT, tune up the station until you can identify it by its call letters.
3. Switch your radio compass to the LOOP position.
4. Rotate the loop until you get a complete fade (aural null) in the station. Write this compass reading down.

5. Add this compass reading to the true course of the airplane. This may be the station-to-plane or the plane-to-station bearing.

Important: If the sum of these two readings is more than 360°, subtract 360° to get the correct bearing.

6. Make a note of this bearing. Repeat Steps 1 through 6 for the other two stations. Do this quickly and accurately. Then plot these three bearings on your map and extend the lines on both sides of the stations. The lines will form a small triangle, the center of which is your fix, or position at the time you took your first bearing. Allow for the proper lapse of time on course to estimate your actual position.

Homing

There will be many times when you want to home on your radio compass. For instance, you may know your position accurately and know the station is a few miles ahead of you, but because of poor visibility you have trouble locating it. You can home with your radio compass on COMPASS or LOOP position.

Procedure

1. Rotate the needle on the compass azimuth control to 0 (if NM-26V type radio is used).
2. Tune up and identify the desired station on REC ANT position.
3. Switch the radio compass to the COMPASS position. The compass indicator swings toward the station.
4. Turn the plane to whatever direction the needle is swinging and keep the needle centered until you arrive at the station. Control the sensitivity of the needle with the compass knob on the face of the radio compass.

Loop Homing

When static conditions are so severe that you cannot accurately home by following the compass indicator, home on the loop and aural null:

1. Rotate the loop to 0 (if NM-26V type radio compass is used).
2. Tune up and identify the desired station on REC ANT position.
3. Switch the radio compass to the LOOP position.

4. Turn the airplane until you hear a complete fade (aural null) of the signals.

5. Make a note of your magnetic heading to maintain this null.

6. Turn 90° to the right and fly this heading for 5 minutes.

7. Then turn to the left until you obtain the aural null again.

8. If your magnetic compass heading is less than the first one, the station is ahead of you. Continue to fly your aural null until you reach the station.

9. If your magnetic compass heading is more than the first one, the station is behind you. Make a 180° turn, pick up the aural null and fly until you reach the station.

Hints About Using Radio

When flying a beam problem on the command set, tune the volume on the jackbox as high as it will go and control your volume with the volume control on the command receiver.

Always have your headset on when taking a fix.

The foregoing description of how to use the radio compass for navigation is necessarily brief. For more details study your 30-100 Series T. O.'s. These T. O.'s describe all your radio navigation methods in detail. Study them. Learn them. The day will come when you need to know all there is to know about radio navigation.

INSTRUMENT FLIGHT



The knowledge of instrument flying is a pilot's best life insurance. There is no halfway point in instrument flying. A pilot who just gets by on instruments is far worse off than the old-fashioned seat-of-the-pants pilot. Instrument flying is not difficult, but it requires knowledge and delicate, exact procedures. It requires physical coordination, plus the ability to relax, physically and mentally, and to have absolute faith in your instruments.

It is your job to know that the instruments are in proper condition for instrument flight. Know how to determine faulty instruments.

Make an instrument cockpit check before every flight on which there is a possibility of instrument conditions.

Develop the habit of cross-checking the full panel of flight instruments until you are able to recognize correct or incorrect operation subconsciously.

INSTRUMENT COCKPIT CHECK

**1. Airspeed Indicator**

Re-check to see that pitot covers are off. Turn the pitot heat switch ON for 5 seconds and have someone feel the head to make sure it heats up properly.

If it doesn't heat up, check the forward junction box to see that the circuit protector has not popped out.

Note any deviations which are listed on the airspeed compensation card.

2. Altimeter

Set your altimeter to the station altimeter setting and note the indicated altitude. It should indicate the field elevation. If there is any difference between the altimeter indication and the actual field elevation, it indicates a scale error in the instrument. Allow for this during flight. If the scale error is greater than 50 feet, return to the line and have the instrument repaired or replaced.

3. Magnetic Compass

The magnetic compass itself is behind the gunner's compartment and relays its reading electrically to the pilot. This is a magnesyn type compass. Turn the plane to some known direction, parallel to a runway or on a compass rose. The needle should turn while the airplane turns and finally indicate the runway heading.

If there is a difference between runway heading, or compass rose, and needle indication, check when compass was last swung.

If the needle does not turn at all, have the gunner check the circuit protector on the relay box in the gunner's compartment.

Be sure your compass is accurate. Your navigation can be no better than your compass.

4. Vacuum Selector Valve

Turn the vacuum selector valve, directly behind the pilot's head, to each engine and see that both pumps are operating properly.

Check the suction gage for a reading on each engine of between 3.7" and 4.7" Hg. The vacuum pumps should deliver normal pressure with the engines at idling speed.

5. Rate-of-climb Indicator

Check the rate-of-climb indicator to see that the needle is at zero. If it isn't, tap the instrument casing and check to see if the needle returns to zero. If not, have the instrument replaced.

6. Artificial Horizon

See that the artificial horizon is uncaged before you start the engines.

Adjust the miniature aircraft to neutral as indicated by the horizon bar. Allow sufficient time for the rotor to gain speed (5 minutes at approximately 4" Hg.). If the horizon bar descends quickly to the horizontal and remains

at the correct position for the attitude of the aircraft, the instrument is operating normally.

In the A-26 the horizon bar may remain in a tilt even after the engines have been running for some time. If this happens, slowly cage the gyro and then uncage it. It should then remain in the correct position. If the horizon bar even temporarily departs from the horizontal after the rotor speed is obtained, the instrument is not operating properly.

Check to see if the horizon bar tips while making taxiing turns. Tipping indicates that the instrument is not operating properly. If it tips, have it replaced.

7. Turn Indicator

After the engines are started, cage the instrument and then twist the caging knob, and at the same time pull it out sharply. If the card spins after the knob is pulled out, the instrument is unreliable.

Set gyro to the magnetic compass reading before taxiing out. Re-check the relationship between the two immediately before takeoff. If there is any great difference, the instrument is not operating properly.

In flight, re-set your gyro with your magnetic compass heading frequently.

8. Bank-and-turn Indicator

Ground Check

While taxiing, turn the plane to the right and left. Note the reaction of the turn needle. If its indications are not positive, or if the needle is sluggish and does not return to zero promptly when the turn is stopped, the instrument is not operating properly.

Flight Check

Establish straight and level flight at 200 mph. Make coordinated single needle-width turns, left and right. Check the degree of bank on the artificial horizon. If the degree of bank is approximately 25° at 200 mph, the turn indicator is operating properly.

If your indicator is out of adjustment, write it up in Form 1A.

Instrument Flight

Make the 30-100 Series of T. O.'s your bible of instrument flying.

These T. O.'s provide the best single source of information for instrument flying that has ever been written. Read them thoroughly and carefully.

The A-26 has the fatigue range of a medium bomber, but unlike other long-range airplanes there is no copilot nor autopilot to help you fly instruments. In other words, you do all the work all the time.

The lag of flight instruments is great because the airplane is extremely fast. Plan well ahead of the airplane and make your corrections small but definite.

Always use full panel instruments under actual conditions. **Don't save any of your instruments for the Saturday night dance!** Keep your eyes constantly moving from one instrument to another and correct each one immediately. This eliminates any necessity for large corrections.

Your mental attitude is of the utmost importance while flying instruments. Don't fight the airplane. Relax and trim your plane in the normal manner.

Use trim for climb, descent, and straight and level flight. Do not trim off the back pressure which you have to apply in turns. Even in steep turns in the A-26 you can hold all the necessary

pressure with one hand. By trimming this pressure off you destroy the feel of the airplane.

Never make more than a 30° bank while on instruments; the possibility of a diving spiral becomes too great. If you do get in a diving spiral, roll out of the turn and then apply back pressure to stop the dive. Watch for the zoom as you recover, and do not overcontrol.

Don't be lazy or over-eager in making instrument turns. Make your movements definite and sure. Use your altimeter and airspeed to maintain constant altitude in turns, because the rate-of-climb indicator is of no practical value while in turns. Ignore it—its lag is too great.

When flying contact, practice rolling in and out of turns, noting rudder pressures necessary to keep the ball centered. You soon get the feel of the required rudder pressure necessary to roll in and out of turns during instrument conditions.

Predetermined Power Settings

The rate of climb or descent is governed by the use of power and airspeed. Predetermined power settings help you establish the proper rate of climb and descent. Individual airplanes with different load conditions cause the exact settings to vary slightly.

DESIRED PERFORMANCE	POWER SETTINGS
1. Level flight at 170 IAS	22" Hg. and 2100 rpm
2. Level flight at 160 IAS (wheels down)	28" Hg. and 2300 rpm
3. Climb at 170 IAS (500 feet per minute)	28.5" Hg. and 2300 rpm
4. Descent at 160 IAS (500 feet per minute, wheels and 1/2 flaps)	28" Hg. and 2300 rpm

Instrument Takeoff

Instrument takeoff procedure differs little from normal takeoff. Set the turn indicator on 0 and hold it constant until you are 500 feet in the air. Your gyro compass is your directional guide. Your airspeed indicator is your bible for climb.

Use your artificial horizon to keep your wings level.

For instrument takeoff, always double check the cockpit.

Entering an Overcast

Before entering an overcast, level off while still on contact and allow your instruments to stabilize. Check and set them for proper operation; then you're ready to enter the overcast.

Instrument Letdown

Know how to make instrument letdowns clean (with wheels up) and with wheels down and $\frac{3}{4}$ flaps. In either case the go-around is not critical. If the ceiling is exceptionally low, drop your wheels before you hit the cone of silence. This gives them plenty of time to come down and lock and gives you time to square off for good approach.

When less than 1500 feet above the ground never descend on instruments at a rate exceeding 500 feet per minute. Drop $\frac{3}{4}$ flaps on the final approach to the runway. When your wheels touch the runway, drop the remainder of your flaps immediately and put the nose-wheel on the ground so you can apply brakes quickly.

COLD WEATHER OPERATION



Cold weather operation of the A-26 calls for special equipment and procedures.

De-icer boots and arctic equipment may be installed.

Besides the regular preflight inspection for normal operation, you must perform the following steps if the temperature drops below 0°C:

1. Preheat the engine. As much as 2 hours may be required to heat the engine when the temperature is extremely low.
2. Preheat the oil. Oil should be heated to a temperature of approximately 95°C just before starting the engine.
3. Check all fuel selector valves for proper operation.
4. Check the Y and oil pump drains for ice and congealed oil.
5. Check for proper operation of the de-icer, anti-icer, defroster, and heating equipment.
6. Remove all frost, snow, ice, and water from the wings, tail, and control surfaces.
7. Check pitot tube for ice or stoppage.

Starting Engines

If you have preheated the engine properly, start it in the normal manner. If the engine is cold, more priming is necessary.

Do not use the battery for initial starts except in emergencies. If it must be used, store the

battery in a warm place until just before you need it. A warm battery produces much more energy than a cold one.

After the engines are running, idle them at 1600 rpm until the oil pressure is normal.

Operate the bomb bay doors and flaps to their fullest extent to remove any ice that may have formed.

Cold Weather Takeoff

Always keep your cowl flaps at least slightly open, regardless of the cold. Close or nearly close the oil cooler doors to prevent the oil from congealing. Use some carburetor heat when you are climbing in a cold rain, snow, or sleet, or when visual wing icing exists.

After takeoff operate your gear several times to prevent freezing in the up position.

Cruising

Watch your oil temperature closely. Oil congeals quickly, and when it does, the oil temperature goes up rapidly and the oil pressure drops off. If your oil congeals and closing the oil doors does not help, then increase your rpm to free the congealed oil.

Limit your airspeed to 300 IAS when the de-icers are operating and 350 IAS when they are not operating.

Approach

Make all approaches power-on in cold weather to prevent the engines from cooling off too much.

Remember, de-icer boots in operation in-

crease stalling speed. Always turn off the boots before entering traffic to land. Never take off with them operating.

Use extreme caution when you apply your brakes after landing on a slippery runway.

Correct Procedure for Oil Dilution

Anticipated Lowest Outside Air Temperature

4°C to -12°C

-12°C and lower

Dilution Time

4 minutes

Dilute 4 minutes and use heat before next start.

Never dilute longer than 4 minutes.

1. Idle the engine at 800 to 900 rpm.
2. Make sure oil temperature is below 50°C and oil pressure remains above 20 psi.
3. Booster pumps OFF for oil dilution.
4. Hold the oil dilution switches in the ON position for the desired length of time. (A drop in fuel pressure occurs if the dilution is normal.)
5. Advance the throttles to 1200 rpm.
6. Depress the feather button and hold it until the propeller runs through its complete feathering cycle at least twice.
7. When dilution time has elapsed, stop the engines in the normal manner.
8. Do not release dilution switches until engines stop.
9. Turn boosters on HIGH and be sure that fuel pressure returns to normal. (This indicates that oil dilution switches are not stuck.)



On the Ground

When you park the airplane on snow or ice, place a layer of fabric, grass, straw, or other insulatory material under the wheels. If you don't do this, large hunks of rubber will be pulled from the tires when you move the airplane from its frozen position.

TAXI WITH EXTREME CAUTION ON ICY SURFACES

UNUSUAL OPERATING CONDITIONS

In Hot Weather

Your takeoff run is longer.
Don't overheat on the ground.

Taxiing on Soft Ground

Do not taxi over soft ground until the area has been thoroughly checked for soft spots and muddy holes. **Your prop clearance is only 15".**

Know your best path of travel and keep moving steadily, keeping the nosewheel as straight as possible.

If the nosewheel gets mired, it will probably cock. **Under no circumstances try to blast it out with throttles.** Stop your engines and have the airplane towed out.

Takeoff on Rough or Soft Terrain

Consider the weight of airplane, the velocity of the wind, and attitude of the field before you attempt takeoff.

Use up to $\frac{1}{2}$ flaps if necessary.

After you apply full takeoff power, pull the nosewheel slightly off the ground as quickly as possible. This relieves the weight on the nose during the takeoff run.

Make normal landings on soft terrain.

When flying in the rain, visibility is extremely restricted and you are on instruments most of the time. Avoid landing in the rain whenever possible. When landing on a wet runway, use extreme caution when applying the brakes.

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