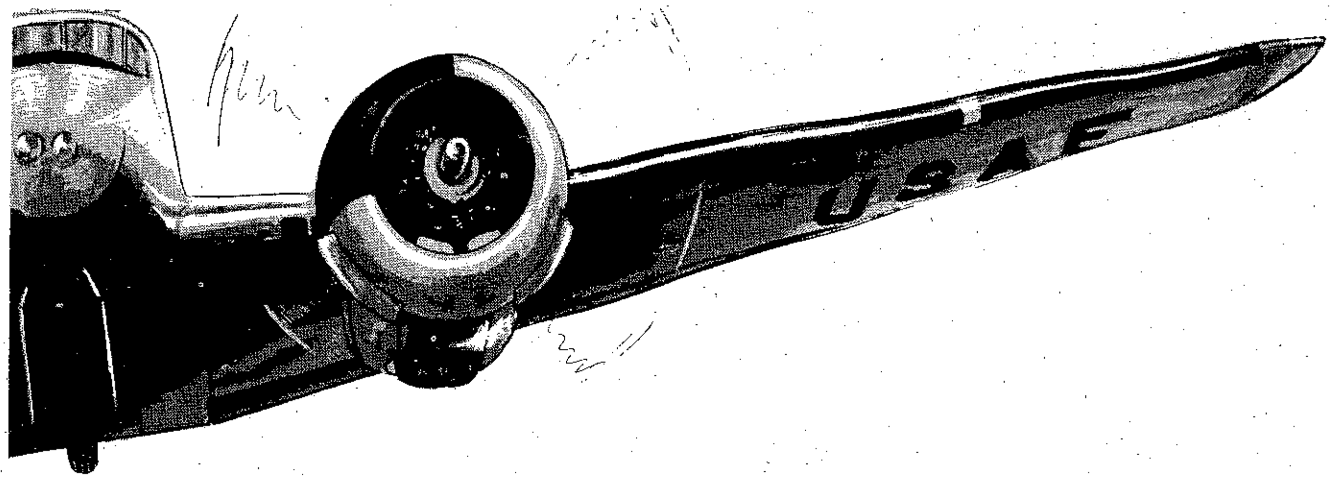
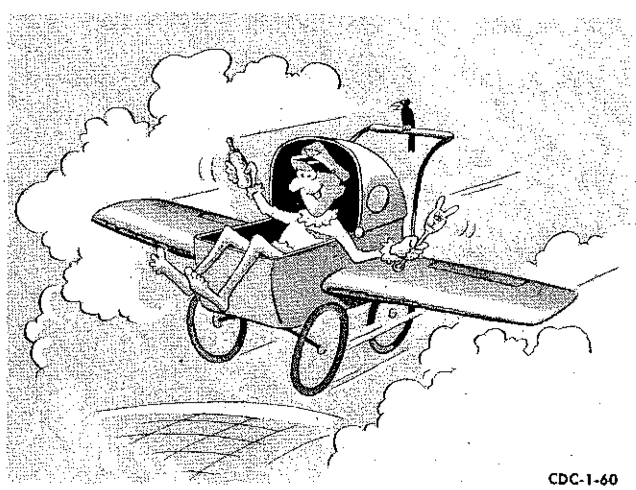


section VI FLIGHT CHARACTERISTICS

CDC-1-59

STABILITY.

Characteristically this is a stable aircraft. Once trimmed for a specific flight condition, it requires a minimum of pilot attention The trim tabs, provided on all controls, have sufficient effect for all conditions you may encounter.



CDC-1-60

CONTROL PRESSURE.

The pressures required in manipulating the flight controls are best described as light. Extreme tab settings can readily be overridden. Aileron and elevator pressures can be applied individually or together with one hand. In fact, a very common error is over controlling.

LANDINGS.

The effect of flight controls remains positive throughout a landing. After you are on the ground, however, and the aircraft is slowing down, remain alert to the effectiveness of your rudder and be prepared to supplement it with power and/or brakes for directional control.

STALLS.

In either power on or power off stalls, the aircraft gives ample warning before the actual stall. There is considerable tail buffeting which is very apparent. During this period of approach to a stall, recovery is possible with no loss of altitude. Even when the aircraft is completely stalled, no extreme changes of attitude are necessary to recover. If the aircraft is stalled in a near level attitude, the tendency will be for it to "mush" without the nose dropping any great amount. If stalled in a nose high attitude, the aircraft will "mush" for a period, then the nose will drop. In either case, although the left wing may drop first, there is no great tendency for the stall to develop into a spin. Recovery can be effected by a relaxing of back pressure and an addition of power. It is not necessary to dive the aircraft.

SPINS.

Although intentional spins are prohibited, you may at some time find it necessary to recover from one. If so, the proper procedure is as follows:

Throttles — CLOSED.

Apply opposite rudder to stop rotation.

Apply enough forward pressure to relieve the stall.

Recover from the resulting dive as rapidly as possible without imposing excessive wing loads.

NOTE

Power should not be used in spin recovery. Power will be of no advantage in your recovery and it will increase diving speeds.

STALL CHART

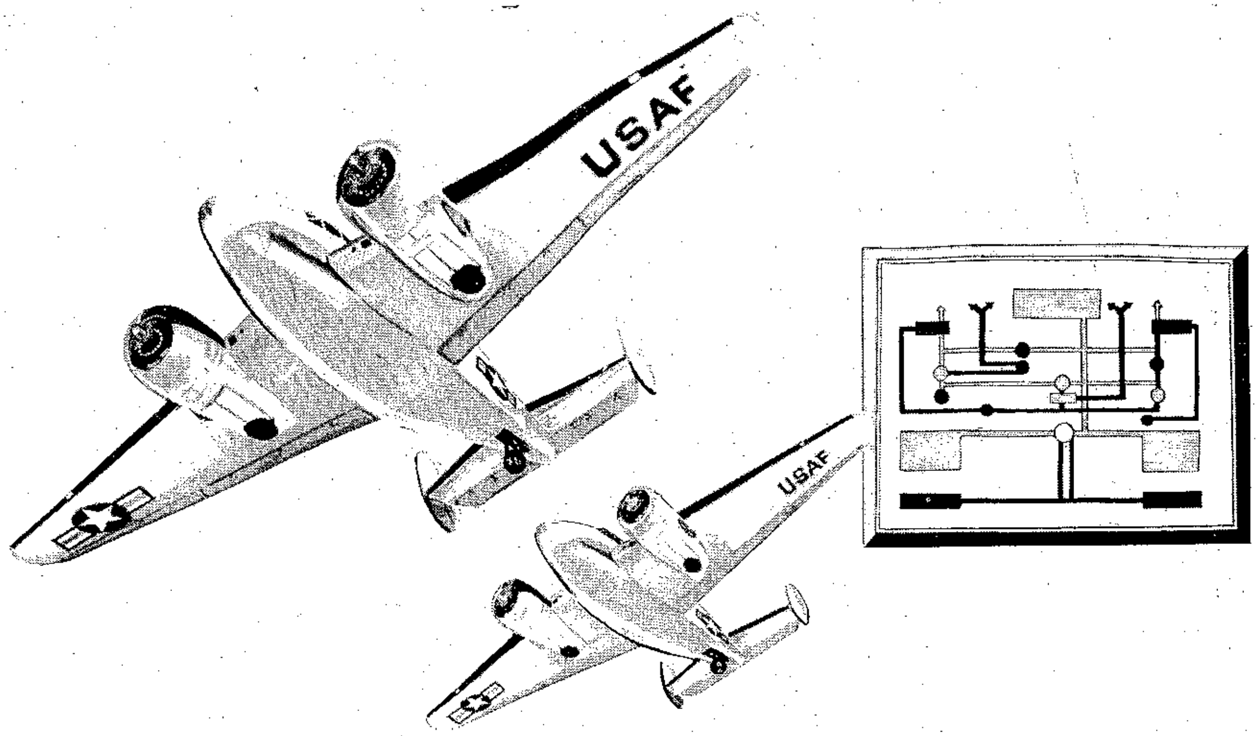
GEAR AND FLAPS UP									
GROSS WEIGHT (LB.)	C. G. (POS)	POWER ON (MAX. CONTINUOUS POWER)				POWER OFF (WINDMILLING PROP)			
		LEVEL	15°	30°	45°	LEVEL	15°	30°	45°
7500	FWD.	69	70	73	82	77	78	82	90
	REAR	66	67	70	78	73	74	78	86
8500	FWD.	73	76	80	88	81	82	87	97
	REAR	70	72	76	84	77	78	83	92
9500	FWD.	78	79	84	92	86	87	92	102
	REAR	74	75	80	88	82	83	88	97
10500	FWD.	82	84	88	98	90	92	98	108
	REAR	78	80	84	93	86	88	93	103

GEAR AND FLAPS DOWN (45°)									
GROSS WEIGHT (LB.)	C. G. (POS)	POWER ON (APPROACH POWER)*				POWER OFF (WINDMILLING PROP)			
		LEVEL	15°	30°	45°	LEVEL	15°	30°	45°
7500	FWD.	60	61	64	70	71	72	78	85
	REAR	57	58	61	67	68	69	74	81
8500	FWD.	63	64	68	76	77	78	82	90
	REAR	60	61	65	72	73	74	78	86
9500	FWD.	67	68	71	80	81	82	87	97
	REAR	64	65	68	76	77	78	83	92
10500	FWD.	70	71	76	84	85	86	103	108
	REAR	67	68	72	80	81	82	98	103

*POWER APPROACH 2000 RPM, 20 INCHES HG.

GEAR AND FLAPS UP — SINGLE ENGINE					
GROSS WEIGHT (LB.)	C. G. (POS)	POWER ON (MAX. CONTINUOUS POWER)			
		LEVEL	15°	30°	45°
7500	FWD.	77	78	82	90
	REAR	73	74	78	86
8500	FWD.	81	82	87	97
	REAR	77	78	83	92
9500	FWD.	86	87	92	102
	REAR	82	83	88	97
10500	FWD.	90	92	98	108
	REAR	86	88	93	103

Figure 6-1



section VII SYSTEMS OPERATION

CDC-1-62

POWER CHANGE.

The pressures developed within the cylinders of any engine are a prime limiting factor. These brake mean effective pressures (B.M.E.P.) can be built up to a point where they become excessive by improper coordination of propeller levers and throttles. For this reason, the throttles should be retarded before decreasing engine rpm and inversely the rpm should be increased before the throttles are advanced.

MANUAL LEANING.

Since no exhaust gas analyzer is provided in the aircraft, the mixture must be leaned by procedure as outlined below. Manual leaning should only be accomplished for the purpose of preventing engine roughness caused by an excessively rich mixture.

Establish the desired rpm and manifold pressure.

Retard the mixture lever in small increments until an instantaneous drop of 25 rpm is noted. Advance the mixture lever to its last position prior to the sudden drop.

Under normal operating conditions, at altitudes of less than 5,000 feet, the mixture will not be leaned.

FUEL SYSTEM.

BOOSTER PUMPS.

The fuel booster pumps, in the front wing tanks, are used for varied purposes under different conditions. They serve to furnish pressure for starting, but the safety factor they add to the fuel system should not be neglected. The operation of the fuel booster pumps during take-off and landing precludes the possibility of loss of fuel pressure, at a critical altitude, since they will furnish adequate fuel under all conditions of operation. In the event of engine pump failure, booster pumps should be used to maintain pressure.

FUEL TANK SEQUENCE.

The front wing tanks, since they are equipped with booster pumps, shall be used for starting, ground operation, take-off and landing.

For cruising, the rear wing tanks should be used first, the nose tanks next and lastly the front tanks. Using the rear wing tanks prior to the nose tanks will result in a lesser shift in the center of gravity. C. G. limits will not be exceeded regardless of the sequence in which fuel tanks are used, nor will there be any effect on operation; however, the front tanks should be last in order since they are the only tanks from which the booster pumps can draw fuel.

When changing from one tank to another, it is usually possible, by reference to the fuel gage, to make the change before a tank runs dry. This should be considered normal procedure.

At such times as maximum utilization of fuel is necessary, the tanks may be used until exhausted. In doing this, your first indication of fuel depletion is an indication by the fuel pressure warning lights, so watch them closely when your fuel is low.

If the fuel selector is turned to another tank and the fuel booster turned on at the first indication by the warning lights, pressure can be re-established before any interruption in engine operation occurs.

The fuel system is such that neither the engine driven fuel pumps, the fuel booster pumps, nor the cross-

EQUIPMENT	Number of Units	Amps. per Unit	Operating Time-Min	OPERATING									
				Start & Warm-Up					Taxi				
					Average Amp					Average Amp			
				Amp	0.5 Min	2.0 Min	15.0 Min	Min	Amp	0.5 Min	2.0 Min	15.0 Min	Min
C - Control Surface													
Motor, Wing Flap	1	11.80	0.16										
E - Engine Instruments													
Indicator, Carb Mixture Temp.	2	0.07	60.0										
Indicator, Fuel Quantity	1	0.18	60.0 0.358	0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4	
Indicator, Oil Temperature	2	0.02	60.0										
F - Flight Instruments													
Pitot Heater	2	3.30	60.0	6.6	6.6	6.6	6.6		6.6	6.6	6.6	6.6	
Indicator, Vac Pres Warning	2	0.17	Neg										
G - Landing Gear													
Indicator Ldg Gr Position	2	0.17	5.0	0.2	0.2	0.2	Neg		0.2	0.2	0.2	Neg	
Motor, Ldg Gr	1	70.00	0.16										
Light, Ldg Gr Warning	1	1.00	Neg										
Solenoid, Ldg Gr Latch	1	1.00	0.16										
H - Heating, Ventilating & Deicing													
Motor, Propeller Anti-icer	2	2.00	60.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	
Motor, Wing Deicer Valve	1	1.00	60.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	
J - Ignition													
Coil, Booster	1												
K - Engine Control													
Motor, Engine Starter	2	75.0	2.0	75.0	75.0	75.0	10.0						
Relay, Engine Starter	2	0.80	2.0	0.8	0.8	0.8	0.1						
L - Lighting													
Baggage Lights - Nose & Rear	2	0.80	2.0	1.6	1.6	1.6	0.2		0.8	0.8	0.8	0.1	
Compass Light	1	0.19	60.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	
Dome Lights, Clear	3	0.80	2.0	2.4	2.4	2.4	0.3		2.4	2.4	2.4	0.3	
Dome Lights, Red	3	1.50	2.0	4.5	4.5	4.5	0.6		4.5	4.5	4.5	0.6	
Extension Light, B-7	1	0.30	2.0	0.3	0.3	0.3	Neg		0.3	0.3	0.3	Neg	
SUBTOTALS				97.0	97.0	97.0	23.4		20.4	20.4	20.4	13.2	

Figure 7-1. Electrical Load Analysis (Sheet 1 of 4)

CDC-1-63

CONDITIONS																		
	Take-Off & Climb				Cruise					Landing								
	Average Amp					Average Amp					Average Amp							
Amp	0.5 Min	2.0 Min	15.0 Min	Min	Amp	0.5 Min	2.0 Min	30.0 Min	60.0 Min	Amp	0.5 Min	2.0 Min	5.0 Min	15.0 Min				
11.8	3.8	Neg	Neg															
0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4		0.4				
6.6	6.6	6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6				
										0.2	0.2	0.2		Neg				
70.0	22.4	5.6	0.7							70.0	22.4	5.6		0.7				
1.0	0.3	Neg	Neg							1.0	0.3	Neg		Neg				
4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0				
1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0				
0.8	0.8	0.8	0.1		0.8	0.8	0.8	Neg	Neg	0.8	0.8	0.8		0.1				
0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2				
2.4	2.4	2.4	0.3		2.4	2.4	2.4	0.2	Neg	2.4	2.4	2.4		0.3				
4.5	4.5	4.5	0.6		4.5	4.5	4.5	0.3	0.1	4.5	4.5	4.5		0.6				
0.3	0.3	0.3	Neg		0.3	0.3	0.3	Neg	Neg	0.3	0.3	0.3		Neg				
103.0	46.7	25.8	13.9		20.2	20.2	20.2	12.7	12.3	103.2	26.9	26.0		13.9				

Figure 7-1. Electrical Load Analysis (Sheet 2 of 4)

CDC-1-64

EQUIPMENT	Number of Units	Amps. per Unit	Opera-ting Time-Min	OPERATING: Start & Warm-Up Amp	Start & Warm-Up Average Amp 0.5 Min	2.0 Min	15.0 Min	Min	Taxi Amp	Taxi Average Amp 0.5 Min	2.0 Min	15.0 Min	Min
L - Lighting (Continued)													
Flasher, C-2	1	0.90	60.0	0.9	0.9	0.9	0.9		0.9	0.9	0.9	0.9	
Instrument Light Shield, Red	66	0.048	60.0	3.1	3.1	3.1	3.1		3.1	3.1	3.1	3.1	
Landing Lights	2	21.4	1.5										
Map Light	2	0.30	2.0	0.6	0.6	0.6	Neg		0.6	0.6	0.6	Neg	
Passing Light	1	1.50	60.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Radio Controls Light	1	0.80	60.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	
Relay, Landing Light	2	0.35	1.5										
Utility Light	6	0.17	2.0	1.0	1.0	1.0	0.1		1.0	1.0	1.0	0.1	
Tail Lights	2	0.80	60.0	1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	
Taxi Lights	2	5.36	5.0						10.7	10.7	10.7	3.5	
Wing Position Lights	2	0.75	60.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	
M - Miscellaneous													
Motor - Windshield Wiper	1	7.63	60.0	7.6	7.6	7.6	7.6		7.6	7.6	7.6	7.6	
P - D. C. Power													
Battery Charging			60.0										
Battery Relay	2	0.80	60.0	1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	
Indicator, Generator Failure	2	1.17	Neg										
Inverter, AN/ARN-7 Radio	1	15.0	60.0	15.0	15.0	15.0	15.0		15.0	15.0	15.0	15.0	
Inverter, Instrument	1	6.0	60.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	
Propeller Feathering Motor	2	80	0.1										
Propeller Feathering Relay	2	2.4	0.1										
Q - Fuel & Oil													
Motor, Booster Pump	2	2.00	15.0	4.0	4.0	4.0	4.0						
Primer Solenoid	2	0.33	Neg										
Indicator, Low Fuel Pressure	2	0.17	Neg										
R - Radio													
Interphone	1	2.20	60.0	2.2	2.2	2.2	2.2		2.2	2.2	2.2	2.2	
Marker-Beacon Receiver	1	0.65	60.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	
Radio Compass Receiver	1	1.95	60.0	1.9	1.9	1.9	1.9		1.9	1.9	1.9	1.9	
Range Receiver	1	1.60	60.0	1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	
VHF Radio Receiver	1	5.50	60.0	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	
VHF Radio Transmitter	1	7.50	0.5	7.5	7.5	1.9	0.2		7.5	7.5	1.9	0.2	
TOTALS				164	164	158	81		93	93	88	70	

Figure 7-1. Electrical Load Analysis (Sheet 3 of 4)

CDC-1-65

CONDITIONS														
Take-Off & Climb					Cruise					Landing				
	Average Amp					Average Amp					Average Amp			
Amp	0.5 Min	2.0 Min	15.0 Min	Min	Amp	0.5 Min	2.0 Min	30.0 Min	60.0 Min	Amp	0.5 Min	2.0 Min	5.0 Min	15.0 Min
0.9	0.9	0.9	0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		0.9
3.1	3.1	3.1	3.1		3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1		3.1
0.6	0.6	0.6	Neg		0.6	0.6	0.6	Neg	Neg	0.6	0.6	0.6		Neg
3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0
0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		0.8
										0.3	0.3	0.2		Neg
1.0	1.0	1.0	0.1		1.0	1.0	1.0	Neg	Neg	1.0	1.0	1.0		0.1
1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		1.6
										10.7	10.7	10.7		3.5
1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		1.5
7.6	7.6	7.6	7.6		7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6		7.6
81.6	81.6	51.0	30.6		61.2	61.2	38.1	16.5	11.4	20.4	20.4	12.7		7.6
1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		1.6
15.0	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0		15.0
6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0
4.0	4.0	4.0	4.0							4.0	4.0	4.0		4.0
2.2	2.2	2.2	2.2		2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2		2.2
0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6		0.6
1.9	1.9	1.9	1.9		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		1.9
1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		1.6
5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		5.5
7.5	7.5	1.9	0.2		7.5	7.5	1.9	0.1	Neg	7.5	7.5	1.9		0.2
251	195	138	102		144	144	115	83	77	244	188	143		87

Figure 7-1. Electrical Load Analysis (Sheet 4 of 4)

CDC-1-66

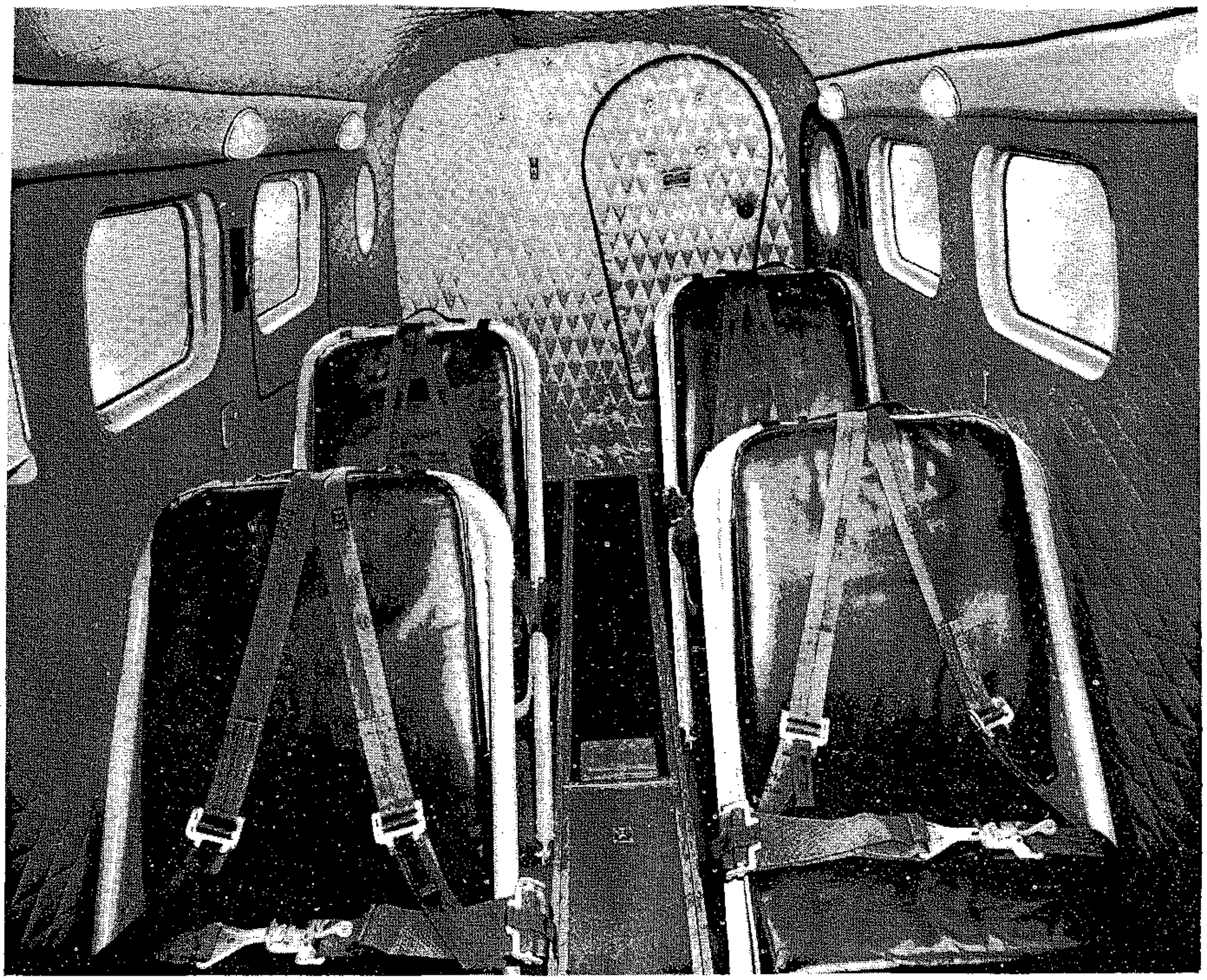


Figure 7–2. Cabin Compartment CDC-1-67

feed system can provide for the transfer of fuel from one tank to another.

When it is necessary to operate both engines from the same tank, the other fuel selector handle should be placed in the "OFF" position. If the suction cross-feed is used the fuel selector handle should be positioned "OFF" after the suction cross-feed handle is placed "ON".

SUCTION CROSS-FEED.

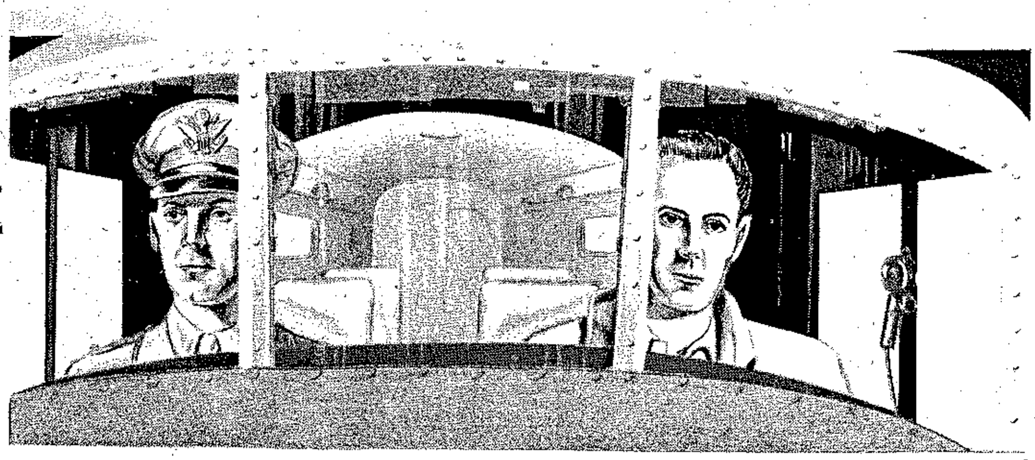
The suction cross-feed is just that, a SUCTION cross-feed which will permit either or both engines to draw fuel from any tank in the aircraft. It will not provide for one engine-driven pump supplying fuel, under pressure, to both engines.

ELECTRICAL SYSTEM.

The progression of aircraft equipment, especially navigational equipment, has imposed on this aircraft an electrical load which can, under emergency conditions, become critical. With both engines and generators operating, sufficient current is supplied for all equipment; with one generator inoperative the amount of electrically operated equipment which can be used is limited.

It is impossible to set down a definite procedure to be followed if all, or a portion, of your electrical power is lost; but, an appreciation of what each item of equipment requires as compared to the power available will make apparent what action must be taken in each situation. Appraise the requirements for each situation, and then turn off all electrical equipment which is not absolutely essential. Keep in mind your generators, at rated output, supply 50 amperes each. With the 100 ampere generator installed, enough current is produced to supply the electrical system while on single engine operation. Figure 7-1, sheets 1 through 4, will show what each item of electrical equipment requires; a thorough study of these charts is very advisable.

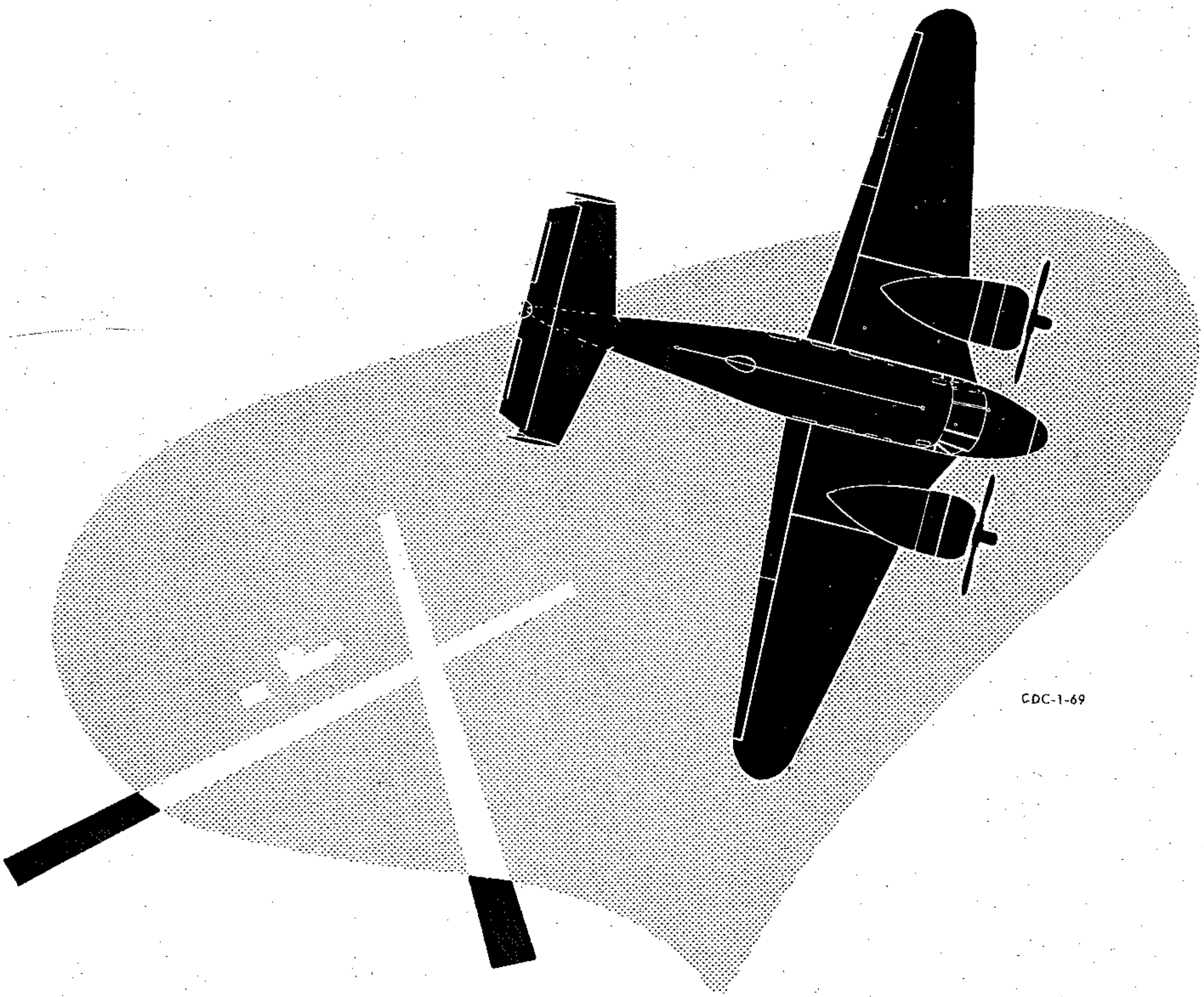
In any event, for ground operation, when generator output is not up to rated capacity, use as little electrically powered equipment as possible.

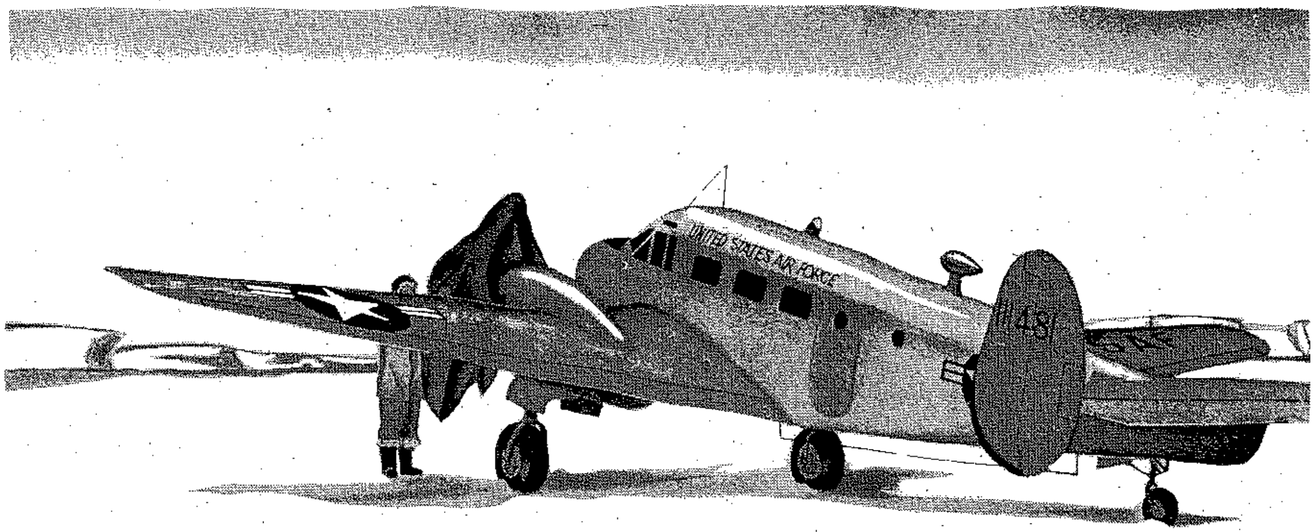


section VIII CREW DUTIES

NOT APPLICABLE TO THIS AIRPLANE

CDC-1-68


CDC-1-69



section IX ALL WEATHER OPERATION

CDC-1-70

INTRODUCTION.

Except for some repetition necessary for emphasis, clarity or continuity of thought, this section contains only those procedures that differ or are in addition to the normal operating instructions covered in Section II. Any discussions relative to operation are covered in Section VII.

OPERATION UNDER INSTRUMENT FLIGHT CONDITIONS.

INSTRUMENT FLIGHT.

Due to low stalling speeds and ease of control, the aircraft is very capable of instrument flight. Equipment on the aircraft that will aid in instrument flight are two sets of blind flying instruments, VHF command radio set which includes the normal channels including all GCA channels, low frequency receiver for range reception, marker beacon receiver and radio compass. With this equipment, it is possible to accomplish any phase of instrument flight including take-off, approach and landing.

NOTE

Due to critical electrical power it is necessary, under instrument conditions, to maintain constant check on generator operation during flight. In the event of one generator failure or single engine operation, monitor the electrical output of the remaining generator. The electrical load should not exceed 0.8 on the loadmeter of the remaining generator. Do not rely on the generator overvoltage light as sole indication of generator failure. This light comes on only after an overvoltage condition. The loadmeter and voltmeter are the only reliable indications of generator operation.

The electrical load is especially critical during night-weather conditions on one-generator operation. Under these conditions, it will be necessary to turn off the MG149F inverter and radio compass to decrease the electrical load to 0.8 or less on the remaining generator. The MG149F inverter is operated by the radio compass switch.

INSTRUMENT TAKE-OFF.

Due to the conventional type landing gear and somewhat restricted forward visibility, when poor visibility conditions exist, the pilot must depend on his instruments for take-off. The take-off and climb will not be difficult if the proper technique is used.

CAUTION

Check the electrical equipment on external power to avoid imposing an unnecessary load on the batteries. During taxiing the rpm is too low for generator output.

Add special emphasis on the following checks:

- Radio facility chart and appropriate handbooks aboard.
- Altimeters — Set on station altimeter setting. (The elevation indicated should be within 75 feet of actual field elevation.)
- Clocks — Set on time given by the tower.
- Gyros — Checked for precision while taxiing, reset and uncaged for take-off.
- Rate of climb — Check for zero setting.
- Vacuum Gage — Check at 4 inches hg.
- Generators — Check operation.
- Pitot Heat — Check operation with crew chief, then use as desired.

Propeller Anti-Icing — Check fluid quantity and operation and turn OFF.

De-icing Boots — Check operation and turn OFF.

Windshield Wipers — Check and use as desired.

Cabin Heat — Check Windshield Defrosting and use as desired.

Manifold Heat — Check operation, for a temperature rise and place in cold position.

Radio Compass — Set on station to be used and the pointer checked for movement while taxiing.

VHF — GCA channels checked and the operator standing by.

Inverter — ON.

Instruments — Warmed up and operating properly.

Normal take-off power settings will be used. After the proper checks have been completed, obtain tower approval and line up in take-off position. Reset the directional gyro to the runway heading apply power evenly, and at approximately 25 inches manifold pressure release the brakes and continue the addition of power to full take-off power. Watch the directional gyro to maintain runway heading and use asymmetrical power with the rudders and individual braking if necessary to maintain direction control until complete control is possible through use of the rudders. On reaching an airspeed that the empennage rises off the runway without applying pressure to the elevator control, establish a slightly nose high attitude by holding the aircraft so the attitude indicator in the gyro horizon will be level and approximately 1/4 inch above the horizontal bar. Maintain this attitude until the aircraft gains flying airspeed and clears the runway.

INSTRUMENT CLIMB.

As the aircraft clears the runway, adjust the attitude as needed to establish a definite climb: Gyro horizon indicating plane approximately 1/4 inch above the horizontal bar, airspeed increasing toward minimum safe single engine airspeed, rate of climb indicating approximately 500 feet per minute climb, directional gyro steady on the runway heading and the altimeter indicating an increase in altitude. Retract the landing gear and on reaching minimum safe single engine airspeed reduce to climb power. During normal climb, hold 120 mph indicated airspeed. For ease of control, avoid a degree of bank in excess of 20 degrees during climb.

TURBULENT AIR PENETRATION

"THE HEAVIEST TURBULENCE NORMALLY OCCURS BETWEEN 10,000 AND 20,000 FEET. IF A PENETRATION MUST BE MADE, A SAFE, MORE COMFORTABLE AIRSPEED CAN BE FOUND BY ADDING 60 KNOTS (70 MPH) TO THE POWER-ON STALL SPEED FOR THE WEIGHT AND CONFIGURATION BEING FLOWN."

Figure 9-1

CDC-1-71A

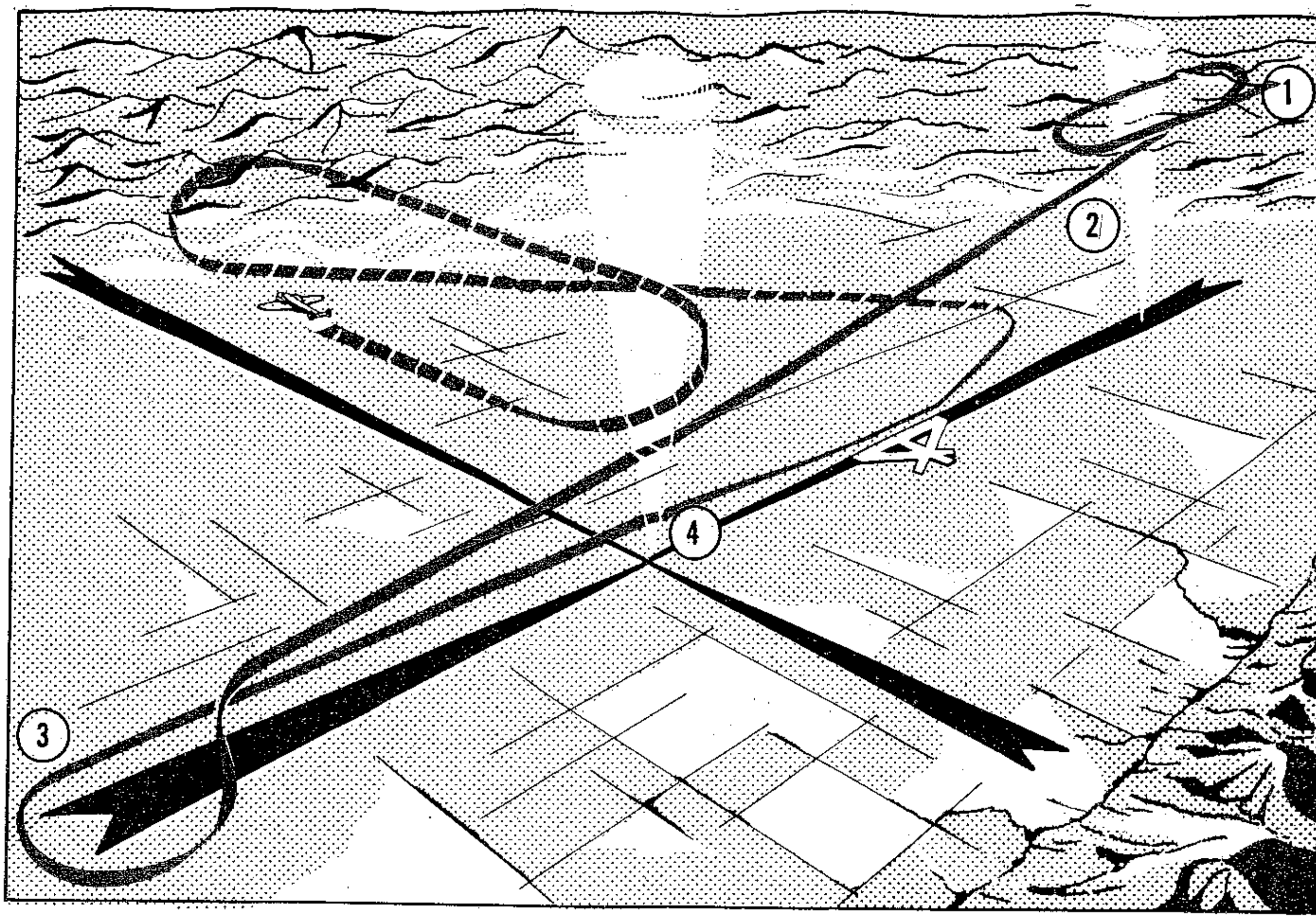


Figure 9-2. Radio Range Letdown

DURING INSTRUMENT CRUISING FLIGHT

NOTE

> As a precaution against clogged pitot lines, pitot heat should be used at all times when instrument conditions are encountered and icing is possible.

Keep the aircraft trimmed by use of tabs on all control surfaces.

RADIO AND NAVIGATION EQUIPMENT.

The radio equipment on the aircraft is normally reliable, however, cross check on all the radio and navigation equipment in flight and never depend entirely on any one unit.

DESCENT.

All descents should be made with the mixture levers in the Full Rich position. When a lower than cruising airspeed is desired for descent, slow the aircraft to the desired airspeed before starting the descent.

NOTE

> Cruising at a constant airspeed a reduction of 5 inches Hg will result in approximately a 500 fpm rate of descent if IAS is maintained.

HOLDING.

Recommended airspeed for holding is 120 mph. Any maneuver prior to a possible approach and landing should be accomplished at 120 mph with the pre-traffic pattern check completed. Make all turns standard rate. Because of its low stalling speed, the aircraft should handle well during holding procedures.

NOTE

(Deleted)

INSTRUMENT APPROACHES.

Again, due to low stalling speeds, instrument approaches should be easily accomplished in the aircraft. Complete the pre-traffic pattern check before the approach is actually started. This gives the pilot more time to concentrate on headings and altitudes, range or GCA procedures, etc. ILS equipment is not installed in the aircraft.

NOTE

> 21 inches Hg and 2000 rpm with the flaps up and gear extended should give approxi-

mately 120 IAS. To descend at 500 fpm, retard the throttles to 17 inches Hg. To descend on final approach at 500 fpm let throttles remain at 21 inches Hg and drop 30 degrees of flaps.

RADIO RANGE LETDOWN. The following procedure is recommended and includes holding, see figure 9-2.

1. Going into the holding pattern or nearing the range for an approach, lower the airspeed to 120 mph and complete the pre-traffic pattern check list as outlined in Section II.

2. When the aircraft is cleared by the tower to descend for an approach, start the descent by lowering the landing gear and increasing the rpm to 2000.

3. On completing the procedure turn, set the flaps at 15 degrees.

4. After passing the low cone, use the flaps as needed. Full flaps are recommended for landing.

GCA LETDOWN. The following procedure is recommended along with the GCA operators instructions. Refer to figure 9-3.

1. Estimate when two to three minutes of holding or the GCA identification point; lower the airspeed to 120 mph and complete the pre-traffic pattern check list as outlined in Section II.

2. Lower the landing gear and increase the rpm to 2000 at point of starting descent on reaching the base leg of the GCA pattern.

3. Lower the flaps as needed on reaching the glide path of the GCA approach. Full flaps are recommended for landing.

ICE, SNOW AND RAIN

Ice, snow and rain may affect the operation of the engines, weight of the aircraft, airflow over the lifting surfaces and the pilots' visibility. The aircraft employs wing and empennage deicing boots, propeller anti-icing fluid, windshield and carburetor hot air and pitot heat. It is best to operate all ice combating equipment on the aircraft, excepting the deicing boots, when known icing conditions exist and before it has started to collect on the aircraft.

PROPELLER ICING.

In preparing for propeller ice:

Propeller anti-ice knob — MAX (for a period of 1 minute).

Propeller anti-ice knob — As required.

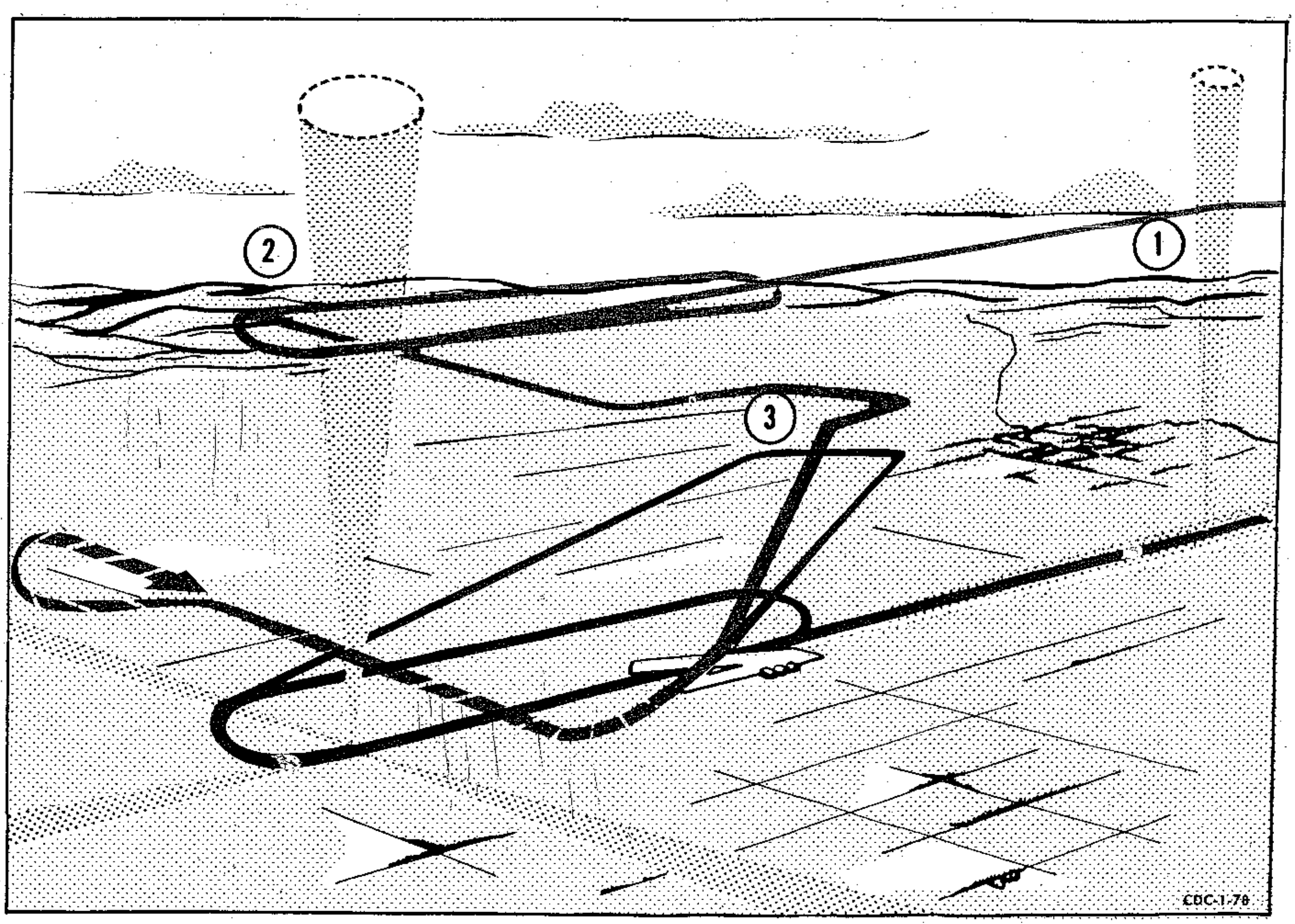
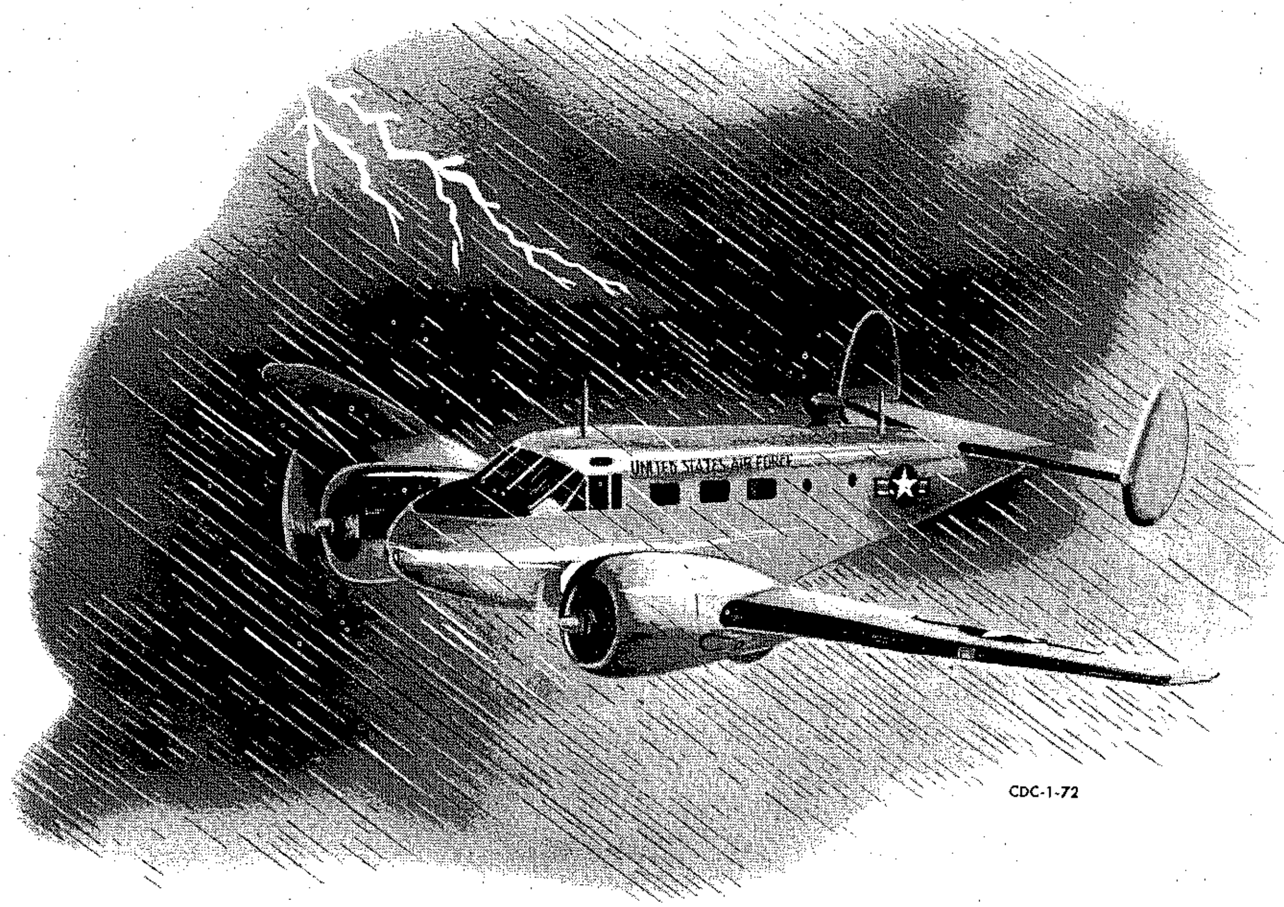


Figure 9-3. GCA Letdown



CDC-1-72

NOTE

The rate of flow of anti-icing fluid necessary to prevent the formation of ice on the propeller will vary greatly with varying conditions; however, if the severity of conditions is unknown, attempt to maintain prevention with NORMAL flow, increasing if necessary. The knob is positioned for MAX flow for the period of one minute to thoroughly lubricate the propeller blades.

CARBURETOR ANTI-ICER.

Manifold heat on the aircraft will, to a degree, eliminate ice which has already formed in the carburetor throat; but it should be used as a preventive measure, rather than a corrective measure.

Take-off and landing should be made without using carburetor heat, but watch for a decrease in manifold pressure indicating carburetor ice and be prepared to use carburetor heat any time full power is not needed. Any use of carburetor heat will decrease the available horsepower.

While in icing conditions, operate the carburetor air doors frequently enough to keep ice broken off so they may be used as needed.

WING AND TAIL DEICER

In the use of this deicing system, the control will be left on continuously in cases of severe icing conditions. Normally, ice will be allowed to build up a slight amount (approximately 1/4 inch) before any attempt is made to deice the wing. Let the ice build up, eliminate it and then turn deicers off.

CAUTION

Under conditions of light to moderate icing, with the deicer operating continuously, ice may form as a shell over the entire deicer area; for this reason, intermittent operation is preferable.

FLIGHT IN TURBULENCE AND THUNDERSTORMS.

Flight through a highly turbulent or thunderstorm area is to be avoided whenever possible.

Under certain conditions, such as at night or where flying on instruments, avoiding these turbulent areas can well be impossible, and so those procedures which result in the safest and easiest operation should be well understood. Utilization of the equipment provided, with ordinary instrument proficiency and normal good judgment, makes turbulent air flying not only possible but safe.

Your most reliable instrument in turbulence will be your attitude indicator (gyro horizon). If the proper attitude for penetration airspeed is established and power adjusted for level flight at this attitude, most difficulties are minimized. This should be accomplished prior to entering the turbulent area whenever possible.

NOTE

If you cannot see a storm area, the intensity of radio static is usually an indication of your approach and distance away.

In flying through turbulent air, you know, or will discover, the most difficult single factor is the maintaining of constant airspeed. By establishing an attitude and power setting for your penetration IAS, your TAS will vary only slightly if this attitude and power setting is maintained. Often the IAS and other pressure instrument readings will give a very false indication of actual conditions, because of the great pressure variation within a storm area and are thus unreliable.

Remember: ESTABLISH THE PROPER ATTITUDE, and then MAINTAIN IT.

For preparing to enter a turbulent area, proceed as follows:

Secure loose equipment.

No smoking.

All seat belts and shoulder harness snug and secure.

Manifold Heat — Hot.

Engine Fuel selectors — FRONT tanks.

Establish penetration speed and note power requirements.

Check all pilot compartment lighting.

Navigation lights — ON.

Automatic pilot — OFF.

Check instruments and align gyros.

Trim aircraft for the selected speed.

Pitot Heaters — ON.

Propeller anti-icers — ON.

Cowl Flaps — Closed.

If lightning is expected, turn all pilot compartment lights to full brilliance.

This will aid in preventing lightning flashes from blinding you.

Turn off all radio equipment rendered useless by storm interference.

Pull circuit breakers for the range and VHF receivers.

When operating in turbulent air, make no turns that are not necessary. When making changes in attitude, use the least control pressure necessary for the required change, thus avoiding unusual loads on the aircraft structure.

COLD WEATHER OPERATION.

Preflight Check.

Have snow, ice and frost removed from wings, tail control surfaces and hinges, propellers, pitot tubes and fuel and oil tank caps and vents.

Test to see that oil Y-drains and oil tank sumps will allow a free flow of oil. Have heat applied if unsatisfactory.

NOTE

Prior to attempting a start at temperatures below 0° F, the engine should be heated sufficiently to obtain fuel vaporization and permit proper engine valve clearances and valve seating.

Thoroughly check controls for free movement.

See that drain hole in bottom of tail cone is open. If this drain is stopped up, water may collect inside cone and freeze, restricting or even blocking elevator travel. Also, see that the felt strip between the movable and fixed parts of the tail cone has been lubricated with grease. When felt strip gets wet and then freezes, it tends to hold the elevator in one position. This situation is not dangerous but the elevator will "stick" and smoothness of control is lost.

Have propeller pulled through at least one blade before engaging starter.

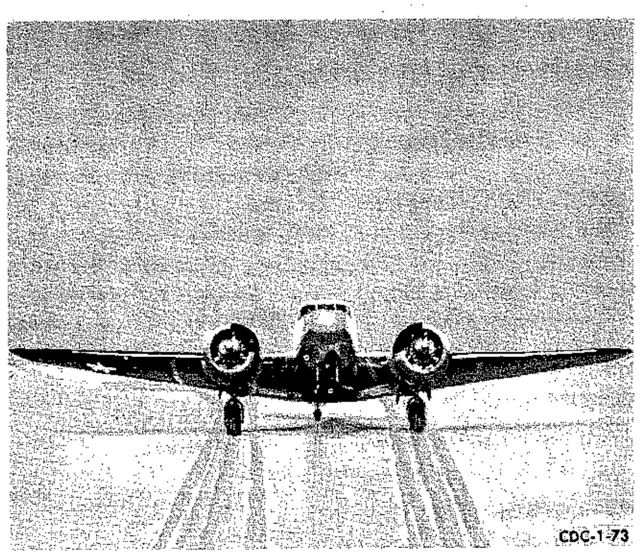
Remove all covers and heaters.

STARTING.

Cold weather starts will be made the same as normal weather starts, with the exception that the throttle opening used for the start should be decreased to a position which will be equivalent to approximately 800 rpm.

NOTE

Moisture forms quickly on spark plug electrodes during cold starts. After three or four unsuccessful attempts, have at least one plug from each cylinder removed and heated to dry the electrodes. Attempt to start immediately after plugs have been replaced.



CDC-1-73

Have cowl flaps at least one-half open during all ground operations. Otherwise the engine accessory section will overheat.

Starts should be made with the oil by-pass lever in hot position.

If there is no oil pressure after 30 seconds running or if pressure drops after a few minutes of ground operation, shut-down and check for blown oil lines or radiators and for congealed oil or ice at Y-drain or in oil tank sump drain.

WARM-UP.

When the outside air-temperatures are low, the general procedure for warm-up will be followed, with the exception that operation at approximately 800 to 1000 rpm will be required until oil pressure is steady and within limits.

Close oil cooler shutters.

If outside air is below -20° C (-4° F) use sufficient manifold heat to improve vaporization and prevent backfiring.

When subjected to excessive drain, storage batteries deteriorate rapidly in cold weather; therefore, none but essential electrical equipment should be used until generators are supplying current. (See Electrical System, Section VII).

Operate propeller through four or five complete cycles from maximum to minimum to replace the oil in the propeller dome with warm engine oil.

When oil temperature reaches 20° C (68° F), move oil by-pass valve to cold position: the by-pass valve will be warmed sufficiently to allow oil to automatically by-pass the radiator if the radiator is blocked by congealed oil.

WARNING

In cold weather, make sure all instruments have warmed up sufficiently to insure normal operation. Check for sluggish instruments during taxiing.

TAXIING.

Do not taxi through puddles of water or slush if they can be avoided. Water splashed onto the wing and tail surfaces will freeze, increasing weight and drag and perhaps limiting control surface movement.

TAKE-OFF.

When operating in slush, be sure tail wheel is locked before take-off since slush may have frozen in locking pin hole, preventing locking and requiring added caution on the take-off run.

If a deep or heavy snow interferes with take-off run but permits taxiing, move slowly up and down the take-off course several times to pack down the runway before attempting actual take-off.

Run up engine prior to take-off, using manifold heat to eliminate carburetor ice.

IN FLIGHT.

Use sufficient manifold heat to prevent rough operation and backfiring.

The propeller should be cycled periodically to keep the propeller dome supplied with warm engine oil so it will be possible to maintain proper propeller operation.

NOTE

If the feathering button pops out before the propeller is feathered, do not hold the button in. Excess pressure due to viscous oil may be causing this premature release of the feathering button; followed in turn by a tendency for the propeller to unfeather. Depress the switch and let it release by internal pressure and then depress it again. Continue this operation until propeller is completely feathered.

LANDING.

Turn off all nonessential electrical equipment at least one minute before final approach to save batteries when rpm is reduced and generators cut out. (See Electrical System, Section VII).

When letting down, watch engine temperatures closely. Keep cylinder head temperature above operating minimums by maintaining sufficient power and regulating cowl flaps. Manifold heat may be used to assure good fuel vaporization, thus minimizing the danger of backfiring and cutting out.

NOTE

Do not fail to use sufficient manifold heat during approach and landing. Be prepared to change manifold heat to cold (UP) position to obtain maximum power if go-around is necessary.

When landing on runways covered with slush or large puddles, avoid leaving wing flaps down after the aircraft is on the ground since heavy sprays of slush kicked up during landing may cause damage. Use brakes sparingly and not until absolutely necessary during landing roll. Keep manifold heat in the hot position while taxiing.

STOPPING ENGINES.

Before stopping the engine, when a cold weather start is anticipated, set the throttle to 800 to 1200 rpm and hold the oil dilution control in the ON position for a period of time as indicated in the table below.

During engine oil dilution, close the propeller feathering switch long enough to produce a drop of 400 rpm. Pull the switch out to release and allow the rpm to return to normal. Repeat this operation three times for each propeller.

4° C to -12° C (40° F to 10° F)	1½ minutes
-12° C to -29° C (10° F to -20° F)	3 minutes
-29° C to -46° C (-20° F to -50° F)	5 minutes

Add one minute dilution time for each additional 5° C (9° F) below -46° C (50°.F).

NOTE

When the dilution time required is in excess of 5 minutes, make certain that the oil tanks do not contain more than 7 gallons each.

If an oil temperature of 50° C (120° F) or less cannot be obtained with the engine running, the engine should be shut off and restarted after the oil has cooled to below 40° C (104° F), after which the engine will be started and dilution of the oil accomplished as previously outlined.

At any time when a long dilution period is required and the oil temperatures exceed 50° C (120° F), it will be necessary to dilute the oil in two or more short periods in order to maintain oil temperatures below 50° C (120° F). On such occasions, the engine will be stopped when the oil temperature reaches 50° C (120° F), allowed to cool until the oil temperature is well below 40° C (104° F), then it will be restarted and the dilution continued. The total of the two or more dilution periods will be that specified in the table.

CAUTION

Dilution of the engine oil when the oil temperatures are above 50° C (120° F) should not be accomplished since the heat of the oil will evaporate the fuel with subsequent lack of proper dilution.

NOTE

When 50 hours engine time have elapsed since the last dilution was accomplished, two dilutions will be used instead of one. On these occasions, the engine will be given the full dilution period and after dilution, the engine will be shut down and the oil pressure screens will be removed and cleaned. This is necessary because the fuel in the oil tends to wash down any accumulated sludge within the engine. After reinstallation of the oil screens, the engine will be started and run for at least 20 minutes at 1000 to 1200 rpm to evaporate any fuel in the oil. After each oil screen cleaning, drain approximately 1 gallon of oil from the "Y" drain to eliminate any sludge which may have collected at this point. The engine will then be again diluted for the specified period of time.

If it is necessary at any time to service the oil tank, the oil dilution procedure must be divided so that some dilution is accomplished before servicing the oil tank and the remainder is accomplished after the oil tank is serviced. It is unwise to service with undiluated oil without additional dilution, as this heavy oil collects and may congeal on the tank bottom blocking the oil flow.

After dilution has been accomplished, shut off the engine by moving mixture control to the IDLE CUT-OFF position, continuing to hold the dilution switch on until the engine stops.

PARKING.

When the aircraft is parked for a period of time, leave some aperture, such as a window, partly open. Otherwise, lack of air circulation within the aircraft will cause windows to frost.

Batteries are easily accessible and should be removed to a warm place for storage.

Cover wings, tail and windshield with tarpaulins, if possible, to prevent frost formation.

FUEL SUMP DRAINAGE.

Have fuel and oil tank sumps drained frequently to remove ice and water which may have collected. Water gets into fuel and oil systems in the form of ice and snow when the tanks are serviced and additional moisture accumulates from condensation. If this is allowed to remain, a drop in temperature may freeze this water, reducing the flow of fuel and oil. Have Y-drain (oil system) drained to eliminate additional water in the oil system.

DESERT PROCEDURES.

Take-Off.

Under extremely hot conditions, aircraft require a longer take-off run. Consider this in loading and use all the available runway.

Loss of power from detonation probably will occur if carburetor mixture temperature exceeds 15° C (59° F).

PARKING.

Leave at least one aperture open when parking in sun so that temperature inside will not be excessive. High temperatures can cause fluid in compass to boil away, dry out electrical insulation and cause inside paint to pull away from skin.

WARNING

All air scoops or vents should be protected, whenever possible, from blowing dust or sand which might restrict air flow during subsequent operation.