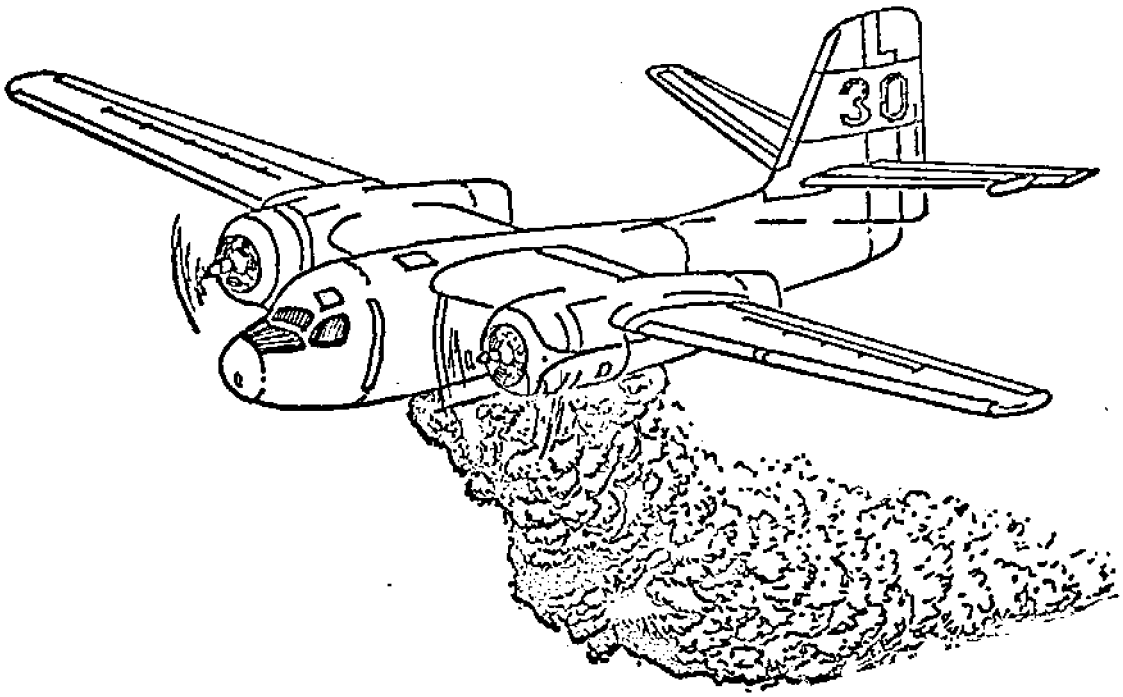
GRUMMAN S-2 RETARDANT TANK SYSTEM OPERATIONS MANUAL

INCLUDING MAINTENANCE AND SERVICE INSTRUCTIONS



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I M P O R T A N T

OPERATORS OF NEW S-2 AIRCRAFT TANKERS NEED TO BE AWARE THAT THE FILLER SYSTEM HAS NOT BEEN TUNED FOR USE WITH RETARDANT MIXES. THIS CAN ONLY BE DONE UNDER FIELD CONDITIONS, AND MUST BE ACCOMPLISHED BEFORE THE AIRCRAFT GOES INTO SERVICE.

UNLESS THE SYSTEM HAS BEEN PROPERLY TUNED, (SEE PARAGRAPH 3.8, PAGE 30.) LOADING PROBLEMS MAY APPEAR, WHEREIN SOME TANK BAYS MAY FILL FASTER THAN THE OTHERS. WHETHER OR NOT SUCH CONDITIONS EXIST MAY BE DETERMINED BY LOOKING INTO THE TANK THROUGH THE AIR VENT PIPES BY MANUALLY DEPRESSING THE VENT DOORS TO ESTABLISH A LINE OF SIGHT.

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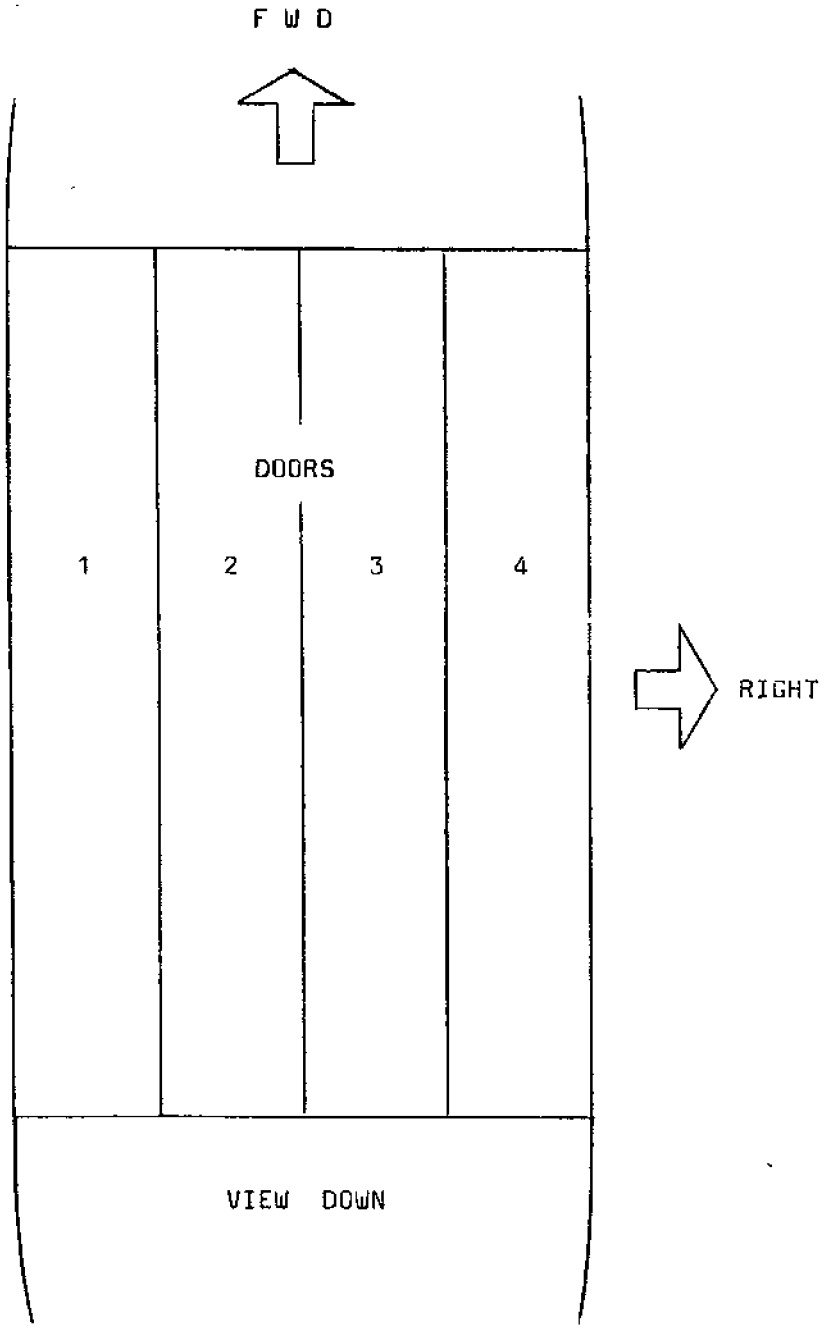

Figure 1-2. Arrangement of the doors.

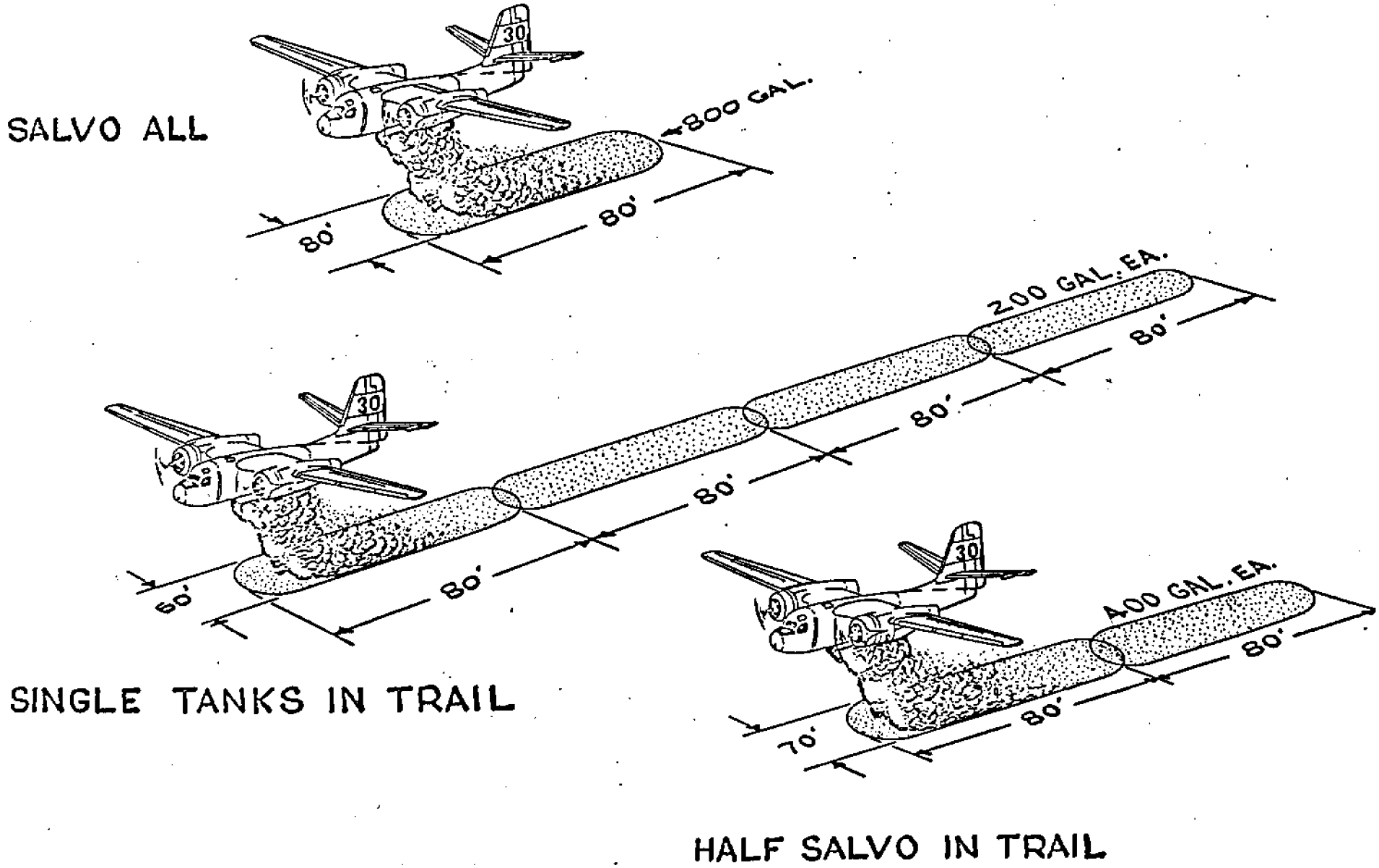

Figure 1-1. Possible drop patterns.

1.0 OPERATION OF THE SYSTEM

1.1 GENERAL DESCRIPTION

Aero Union Corporation's Grumman S2 tank system can hold up to 800 gallons of fire retardant mix. Contained in four separately controlled drop compartments, the retardant can be dispersed in several different patterns, as illustrated in Figure 1-1.

The tank compartments are filled from the tail of the airplane through a single quick disconnect fitting located just below the rudder. Quantity received is indicated to both ground crew and pilot, each being furnished a gauge, one in the cockpit and the other near the filler in the tail.

The tank doors are opened and closed by hydraulic actuators controlled electrically through a sophisticated relay system. The airplane's 1,500 P.S.I. hydraulic system supplies the energy.

1.2 POSSIBLE DROP CONFIGURATIONS

A. One door at a time; manually or automatically sequenced.

B. Two doors at a time; manually or automatically sequenced.

C. Various useful combinations of the above.

D. Four doors at a time.

The numbers and location of the doors is shown in Figure 1-2.

1.3 DROP SYSTEM CONTROL, WARNING AND CONDITION ADVISORY DEVICES

The drop system control, warning and condition advisory systems include the following:

A. Drop system Arming Switch.

B. Drop system "GO" light.

C. Door position lights.

D. Drop Button.

E. Drop Selector Switch.

F. Auto-Manual Switch.

G. Short-Long Switch.

H. Emergency Drop Button.

I. Electrical system protection and control devices

J. Emergency system pressure gauge.

K. Two retardant quantity gauges.

L. Loading system purge valve.

1.4 THE DROP SYSTEM CONTROL PANEL

The drop system control panel (shown in Figure 1-3) is located on the lower portion of the center instrument panel. It contains the following:

A. The drop system Arming Switch.

B. Four door position lights.

C. The Drop Selector dial and switch.

D. The Auto-Manual Switch.

E. The Short-Long Switch.

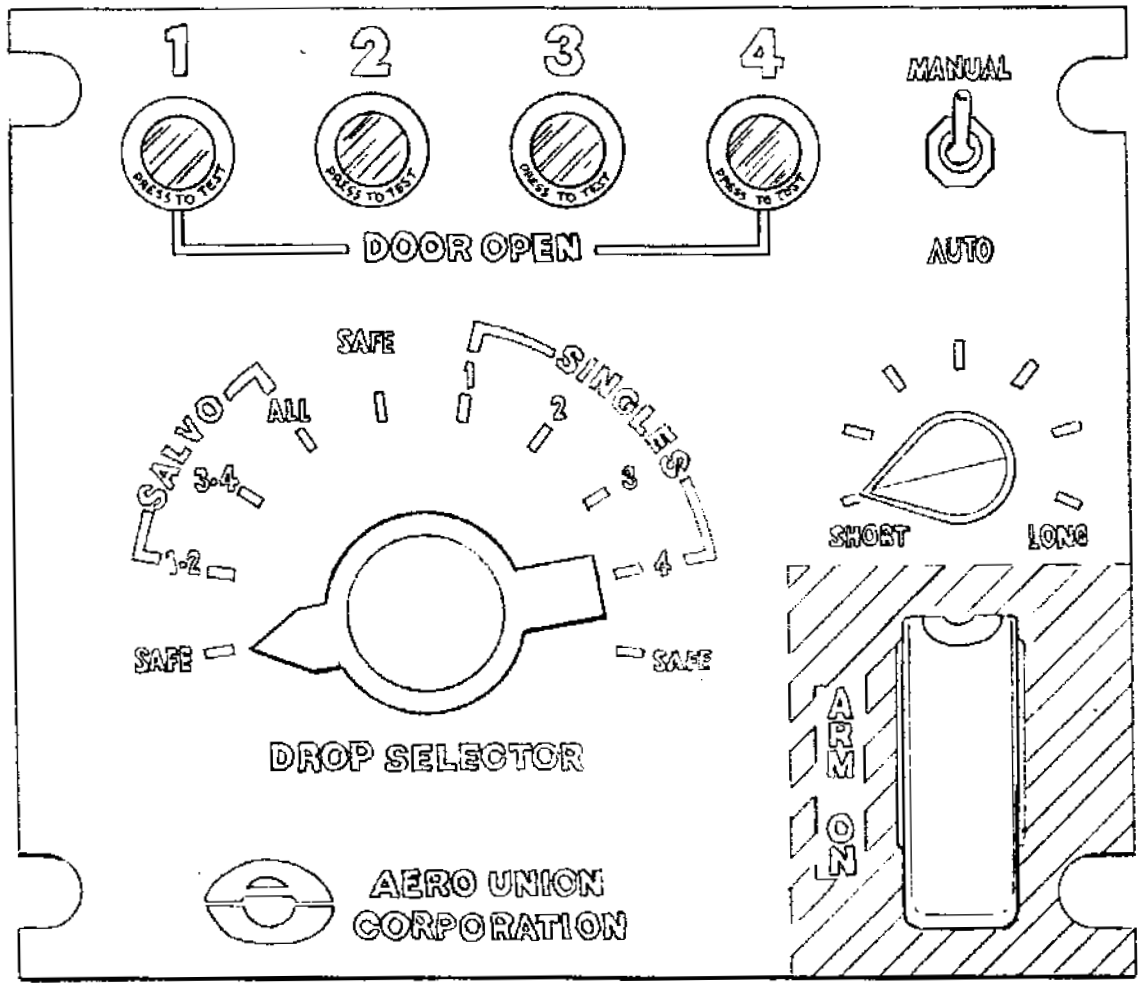

Figure 1-3. The drop system control panel.

1.5 THE DROP SYSTEM ARMING SWITCH

This switch has two positions; "ARM" and "OFF" and is guarded in the armed position. For normal operation of the doors, this switch must be in the armed position.

1.6 THE DOOR POSITION LIGHTS

There is one amber colored light for each of the four tank doors. Each light comes on when its respective door is in the open position; continuing to be lit until the closing door actuates a limit switch in the fully closed and locked position.

1.7 THE DROP SELECTOR SWITCH

The Drop Selector Switch, located on the control panel, is used to determine which doors will open when the Drop Button is depressed. The face plate is marked, as follows:

A. The first "SAFE" position; located at about "8 o'clock" on the face plate. With the Drop Selector in this position, no doors will open when the Drop Button is depressed. The Drop Selector will automatically advance to the next position, however, when the Drop Button is released. Thus, for flight safety purposes, the Drop Selector should be placed in this position and the Arming Switch turned on prior to take-off, so as to allow the pilot to drop the retardant load simply by triggering the Drop Button three times in a row, should an emergency situation arise.

B. The "1 - 2" and the "3 - 4" positions operate pairs of doors, as indicated; either manually or automatically sequenced.

C. The "ALL" position opens all four doors at once.

D. The second "SAFE" position operates in the same fashion as the first.

E. The "1", "2", "3" and "4" position are used to operate the doors in single fashion; either manually or in an automatic mode.

F. The third "SAFE" position. As in the case of the others, no doors will open when the Drop Button is depressed, with the Drop Selector in this position. This position differs from the others in that the Drop Selector will not automatically advance when the Drop Button is released. This is a lock out of the system and the position that the Drop Selector should be in at all times other than at take-off or while preparing to make retardant drops, to prevent inadvertant opening of the doors.

In summary; each time the Drop Button is depressed, the selected doors will open and the Drop Selector will automatically rotate, clockwise, to the next position. When the Drop Button is released, the doors will close after the time delay interval, built into the operating cycle, has passed.

1.8 THE AUTO-MANUAL SWITCH

With this switch in "MANUAL" position, the Drop Button must be depressed and released for each new door selection. When set on "AUTO" the Drop Button need only be depressed once and held to go through a pre-selected sequence automatically.

1.9 THE SHORT-LONG SWITCH

When the Auto-Manual Switch is set on "AUTO", the setting of the Short-Long Switch will determine the time interval between separate drop events. If the switch is set in the "SHORT" position the time interval between door openings will be less than it would be if the switch is set on the "LONG" position.

1.10 THE "GO" LIGHT

The green "GO" light is located in the pilot's glare shield area along with the engine Chip Detector lights. This indicator shows drop system readiness. To be on, the Arming Switch must be in the armed position, the Drop Selector must be in a position other than safe and the system hydraulic pressure must be at least 1,000 P.S.I.

1.11 THE DROP BUTTON

The Drop Button is a guarded push button switch located on the left hand grip of the pilot's control wheel. This switch triggers the door operating mechanisms as programmed on the Drop Selector.

1.12 ELECTRICAL SYSTEM PROTECTION AND CONTROL DEVICES

The electrical portions of the drop system are protected by two circuit breakers mounted on the circuit breaker panel behind the co-pilot's seat.

The junction box and relay panel is located on the forward side of the aft cabin bulkhead, at the rear of the retardant tank.

1.13 THE HYDRAULIC SYSTEM

Under normal conditions, the drop system is hydraulically actuated utilizing the ship's 1,500 P.S.I. hydraulic system to supply fluid flow and return. The operating pressure is shown on gauges located on the overhead panel in the cockpit.

To supply enough volume for uniform operation of doors in all sequences a large accumulator has been incorporated. Ship's system pressure fills the accumulator which has been pre-charged with nitrogen and is directed to four electrically controlled 4-way selector valves by means of a pressure manifold. Each compartment of the tank has it's own 4-way selector valve and actuating cylinder so that when a selection is made and triggered, ready pressure is routed through the valve(s) to the respective actuating cylinder(s), opening and then closing the door(s). A 2-way restricter is located in the upper lines controlling opening and closing speed. Return fluid is accepted back through the valve(s) and channeled to the ship's reservoir by way of the return manifold.

The lower working lines, one for each actuator, contain a shuttle valve separating the normal hydraulic system from the emergency system and is located close to the actuator. To prevent damage to the doors, the 2-way restricter also controls the door opening speed, when the emergency system is used.

1.14 THE HYDRAULIC SYSTEM NITROGEN PRE-CHARGE

The large accumulator used in the normal drop system is divided by a floating piston. The lower chamber is charged with 1,[illegible] P.S.I. of nitrogen to provide a large volume of hydraulic fluid under pressure to the upper chamber for use in the drop system.

This additional volume may be needed if the ship's hydraulic pumps cannot provide sufficient fluid during peak demands. The cushion of nitrogen also acts to dampen surges in the system. The filler valve and pressure gauge are located on the left hand side of the empenage.

1.15 THE EMERGENCY SYSTEM

Should the normal system fail, an emergency pneumatic system is provided. The system consists of a forward mounted nitrogen supply bottle, charged to 1,000 P.S.I. A pressure gauge and Emergency Dump Button are located on the instrument panel. Four shuttle valves, one for each actuator, are located in the hydraulic system between the 4-way valve and lower port of the actuating cylinders.

When the Emergency Drop Button is depressed, nitrogen passes from the supply bottle, through the drop valve; continues through a manifold to the shuttle valves and into the lower ports of the actuating cylinders, opening all 4 doors at once. The hydraulic fluid on the opposite side of the pistons within the actuating cylinders, passes back through a 2-way restricter and each 4-way valve to the ships reservoir. Speed of door opening on emergency mode is controlled by the 2-way restricter. The shuttle valves are automatic resetting and require no adjustment after use of the emergency system.

1.16 USING THE DROP SYSTEM

Prior to take-off and when preparing to make retardant drops:

A. Insure that drop system circuit breakers are set.

B. See that the aircraft hydraulic system has pressure of at least 1,000 P.S.I.

C. Turn on the Arming Switch.

D. Set the Auto-Manual and the Short-Long switches as desired; for either manual or automatic door operations.

E. Rotate the Drop Selector to the desired position. (As previously stated, this switch should be set on the first "SAFE" position, for take-off.) At this point, the "GO" light, located in the same area where the engine Chip Detector lights are found, will come on, providing that the Drop Selector is not pointed to one of the "SAFE" positions. When this light is on, it indicates that the Arming Switch is on, that at least 1,000 P.S.I. of hydraulic pressure has been attained and that a door selection has been made on the Drop Selector.

For semi-automatic drops, set the Auto-Manual switch in the "MANUAL" position and turn the Drop Selector as desired. Push the Drop Button firmly, when ready, holding it in for at least one second. When the Drop Button is released, the door(s) will close and the Drop Selector will automatically advance itself to the next position.

(Note that under normal use, the tank should be emptied from left to right and that if the right hand doors are opened first, the fluid level in the left hand bays will be reduced, as the fluid flows through the interbay check valves toward the right hand bays.)

For automatic drops, place the Auto-Manual Switch on "AUTO" and set the Short-Long Switch as needed for the desired interval between drops.

When ready, push and hold the Drop Button in until all the tank doors have opened or release the button, as desired, to stop the sequence. The doors will close in about 3 seconds after the Drop Button is released.

1.17 LOADING AND MEASURING RETARDANT

The loading of retardant is done through a single quick disconnect fitting mounted on the aft end of the airplane just below the rudder. Quantity received is indicated to both the ground crew and pilot, each being furnished a gauge, one in the cockpit and the other near the filler in the tail. In order to properly reset the gauges, a purge valve, located on the center instrument panel, should be depressed briefly before loading begins.

1.18 GROUND UNLOADING OF RETARDANT

If the tank contains retardant and the need arises to open the tank doors for some reason, a drain port is located in door number 3. An unloading valve assembly is provided which can be inserted in the drainport to empty the tank. To empty bay number 4, the fluid level equalizing rod should be lifted to allow fluid remaining in that bay to flow back into bay number 3 and out the drain port.

1.19 THE FLUID LEVEL EQUALIZING ROD

A red handled rod, connected to a set of internal interbay check valves, is located just inside the aircraft entrance door on the aft side. Under normal circumstances, the rod is left in the retracted position. It is used during ground unloading, as outlined in 1.18 above, or before reloading of retardant, in the event that one or more bays were not emptied during the previous flight.

A situation of this sort can occur when the mission is cancelled after one or more bays have been emptied and retardant remains in the other bays. It can also occur when the entire mission is aborted and the pilot elects to lighten the landing load by dumping bays 1 and 2.

In either case, the equalizing rod should be lifted off the retracted position prior to reloading the tanks in order to start the reloading process with the remaining fluid leveled out. This will help to assure that one or more bays are not over filled while the others are still being loaded. Several minutes should be allowed to pass before the system is reloaded in order to assure that the existing load is leveled out. When using this system, it is important to retract the handle after the tank is filled.

The operator may find value in knowing that the equalizing rod doesn't have to be used when retardant is jettisoned, to reduce the landing load, if it is dropped from bays 3 and 4. By doing this, the internal transfer check valves will automatically allow fluid still in the left hand bays to pass to the right, equalizing the fluid level in all four bays.

2.0 GROUND CHECKING THE SYSTEM

WARNING

KEEP ALL PERSONNEL AND EQUIPMENT CLEAR OF TANK DOORS AND ACTUATORS DURING ANY OPERATIONAL CHECKOUTS OF THE SYSTEM! SERIOUS INJURY TO PERSONNEL AND COSTLY DAMAGE TO THE SYSTEM CAN RESULT FROM FAILURE TO HEED THIS WARNING!

2.1 A GENERAL NOTE

A complete functional check of the system requires that the doors be made to operate in all drop configurations indicated on the Drop Selector Switch.

To supply energy for ground checkout, without running the engines, the aircraft has a secondary hydraulic auxiliary pump located in the left wheel well. In using this system, it is recommended that an electrical power source other than the aircraft battery system be used, whenever possible, to avoid depletion of battery power.

To utilize the auxiliary hydraulic pump for ground check-out power source:

A. Push in the Main and Stand-By Inverter circuit breakers.

B. Turn Auxiliary pump switch on.(Red-guarded switch located on the overhead panel in the cockpit.)

2.2 GETTING READY TO CHECK THE SYSTEM

A. Supply the airplane with an external source of power. (Recommended)

B. See that all aircraft electrical switches and controls are set in off or safe positions.

C. Turn on those switches necessary to supply the retardant tank systems with hydraulic and electrical power, including circuit breakers, as necessary. See Par. 2.1 for recommendations.

D. Check all system warning and advisory lights by using the "Press to Test" feature included in the light assemblies.

2.3 BEGINNING THE SYSTEMS CHECKS

A. Check for pressure in normal hydraulic system accumulator. It should be at 1,000 P.S.I.

B. Check for pressure in emergency system storage bottle. It should be at 1,000 P.S.I.

C. Assure that the Drop Selector Switch is in the "SAFE" position located at "11 o'clock" on the dial face.

D. After establishing electrical and hydraulic power, turn on the Arming Switch.

E. Set the Auto-Manual Switch in the "MANUAL" position.

NOTE: The green "GO" light will not appear at this time.

2.4 CHECK NUMBER 1

Depress and release the Drop Button, holding it firmly for about one second.

RESULT TO EXPECT: With the Drop Selector in the "SAFE" position, no doors should open and the Drop Selector should advance to door number "1" position.

NOTE: At this point a green "GO" light should come on and remain lit in all positions other than "SAFE" and as long as the airplane's hydraulic pressure remains at least at 1,000 P.S.I.

2.5 CHECK NUMBER 2

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Number 1 door should open and Drop Selector should automatically advance, clockwise, to the next position, and in about 3 seconds after the Drop Button is released the door should close and the light should go out.

2.6 CHECK NUMBER 3

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Door number 2 should respond in the same manner as door number 1 in the previous check.

The Drop Selector should advance to the door number "3" position.

2.7 CHECK NUMBER 4

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Door number 3 should respond in the same manner as door number 2 in the previous check.

The Drop Selector should advance to the door number "4" position.

2.8 CHECK NUMBER 5

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Door number 4 should open in the same manner as described in previous checks.

The Drop Selector should advance to the "SAFE" position located at "4 o'clock" on the dial face.

NOTE: The Drop Selector should not advance when the Drop Button is depressed with the selector in this position. It must be moved manually from this position.

2.9 CHECK NUMBER 6

A. Manually advance Drop Selector to the "SAFE" position located at about "8 o'clock" on the dial face.

B. Depress and release the Drop Button.

RESULTS TO EXPECT: No door should open.

The Drop Selector should advance to the door "1 -2" position.

2.10 CHECK NUMBER 7

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Both door number "1" and door number "2" should open simultaneously and the appropriate door lights should come on as in previous checks. About 3 seconds after Drop Button is released the doors should close and lights should go out.

The Drop Selector should advance to the door "3 - 4" position.

2.11 CHECK NUMBER 8

A. Depress and release the Drop Button.

RESULTS TO EXPECT: Doors number 3-4 should open simultaneously and the appropriate door lights should come on as in previous checks. About 3 seconds after the Drop Button is released the doors should close and the lights should go out.

The Drop Selector should advance to the "ALL" position.

2.12 CHECK NUMBER 9

A. Depress and release the Drop Button.

RESULTS TO EXPECT: All 4 doors should open and all 4 door lights should come on. After about 3 seconds the doors should close and the lights should go out.

The Drop Selector should advance to the next "SAFE" position located at about "11 o'clock" on the dial face.

2.13 CHECK NUMBER 10

A. Position Auto-Manual Switch to "AUTO".

B. Rotate the Short-Long Switch to the "LONG" position.

C. Turn the Drop Selector to the door number "1" position.

D. Depress and hold the Drop Button.

E. Release Drop Button when the Drop Selector has advanced to the next "SAFE" position.

RESULTS TO EXPECT: The Drop Selector should automatically advance, opening all 4 doors in sequence, remaining open for about 3 seconds after the Drop Button is released. The door lights should come on in sequence as the doors open, remaining lit as long as doors are open.

NOTE: With the Short-Long Switch turned to the "LONG" position, time lapse between door openings should be noticeably long.

2.14 CHECK NUMBER 11

A. Manually move the Drop Selector Switch to the door "1 - 2" position.

B. Depress Drop Button and hold only until doors "1 - 2" and "3 - 4" indicate open; then release.

NOTE: Continuing to hold down Drop Button will only cause non-functional energizing of doors which are already open.

RESULTS TO EXPECT: The Drop Selector should automatically advance to the "ALL" position or what ever position the selector is in when the Drop Button is released. Doors 1 and 2 should open together; then doors 3 and 4 together and all doors should remain open. The appropriate door lights should come on as the selector advances as indicated in previous checks. About 3 seconds after the Drop Button is released the doors should close and the lights should go out.

NOTE: It is not necessary to check the "ALL" position on the Drop Selector in automatic mode.

2.15 CHECK NUMBER 12

A. Repeat checks Number 10 and Number 11 with the Short-Long Switch in the "SHORT" position.

RESULTS TO EXPECT: A noticeable increase in speed between door openings should occur.

NOTE: The Short-Long Switch will allow an infinite variation in speed between door openings within it's maximum and minimum settings.

2.16 CHECK NUMBER 13

A. Deactivate hydraulic and electrical power to simulate total system failure.

B. Depress the red Emergency Dump Button located on the center instrument panel holding it momentarily.

RESULTS TO EXPECT: All 4 doors should open simultaneously and remain open until hydraulic and electrical power is restored.

NOTE: A bleeding off of residual air will occur in the cockpit in the vicinity of the Emergency Dump Button.

3.0 CHECKING, SERVICING AND ADJUSTING SYSTEM COMPONENTS

3.1 WARNING

SERIOUS INJURY TO PERSONNEL CAN RESULT FROM A FAILURE TO RECOGNIZE THAT THE DOORS AND THE OPERATING MECHANISMS MOVE WITH CONSIDERABLE FORCE AND SPEED. THEREFORE, ALWAYS KEEP IN MIND THE FOLLOWING MINIMUM SAFETY RECOMMENDATIONS:

A. Never attempt to make repairs or adjustments while the system is energized!

B. Always post a guard when operating the drop system on the ground to assure that the area around the tank remains clear of personnel and equipment.

C. Prior to working under the doors, or making any adjustments to the systems, be sure to bleed off residual hydraulic pressure. To do this, apply electrical power and SLOWLY shuttle the Single Engine Rudder Assist Switch back and forth until fluid ceases to be heard returning to the reservoir. Disconnect electrical power. To insure total disipation of hydraulic pressure, manually operate "OPEN" and "CLOSE" side of 1 or more of the 4-way valves until any motion of the actuator ceases and no sound can be detected within the system.

Drain the emergency system pneumatic pressure supply, utiliziing the ground filler point located in the nose cone.

D. The ground crew should stay clear of any operating mechanisms when the rear fairing is removed, whenever pressure exists within the systems.

E. Pull the system circuit breakers whenever feasible.

3.2 NORMAL GROUND SERVICING REQUIREMENTS

A. Disipate all hydraulic residual pressure.

B. Pre-charge the normal hydraulic system to 1,000 P.S.I. through the ground servicing point.

C. Fill the emergency nitrogen storage bottle to 1,000 P.S.I. through the ground servicing point located in the nose.
NOTE: If the emergency system has been used for any purpose; it will be necessary to remove condensed hydraulic vapor from the emergency manifold. To accomplish this, it will be necessary to disconnect the emergency manifold lines from the bottom of the 4 shuttle valves and the center connecting "tee" fitting from the nitrogen supply line. Clear the manifold and the other lines with compressed air.

D. Grease the actuating system lubrication points periodically.

E. Periodic inspection of hydraulic line and components should be made to insure an efficient and leak free system.

3.3 CHECKING AND ADJUSTING DOOR TORQUE SHAFT CENTER LOCK MECHANISMS

WARNING

BE SURE TO DEACTIVATE THE SYSTEMS BEFORE MAKING ANY ADJUSTMENTS! SERIOUS INJURY MAY OCCUR THROUGH FAILURE TO HEED THIS WARNING!!!

A. See that the doors are closed.

B. Determine that the actuator is fully extended.

C. Check the operating linkage to see if a step off of approximately 1/16th inch exists between the edge of the idler arm and the edge of the idler link, as shown in Figure 3-1.

D. Adjust the actuator rod end, as required to obtain the correct setting.

3.4 ADJUSTING LIMIT SWITCHES

A. Be sure to Deactivate the system.

B. Check the operating mechanism past center lock adjustments, as outlined in Paragraph 3.3, before adjusting the limit switches.

C. Adjust the limit switches so that they are actuated when the piston in the hydraulic cylinder is 1/8th inch from the fully extended position.

3.5 CHECKING AND ADJUSTING TORQUE ARM ALIGNMENT

A. See that past-center locking mechanisms are properly set.

B. Open the tank doors. Disconnect the door links at the torque arm end.

C. With the torque shaft(s) rotated to the fully open position, so that the torque arms are pointed down, swing the door(s) towards the closed position, checking the alignment of the door rib assemblies to the center lines of the torque arms, as shown in Figure 3-2 Adjust as necessary.

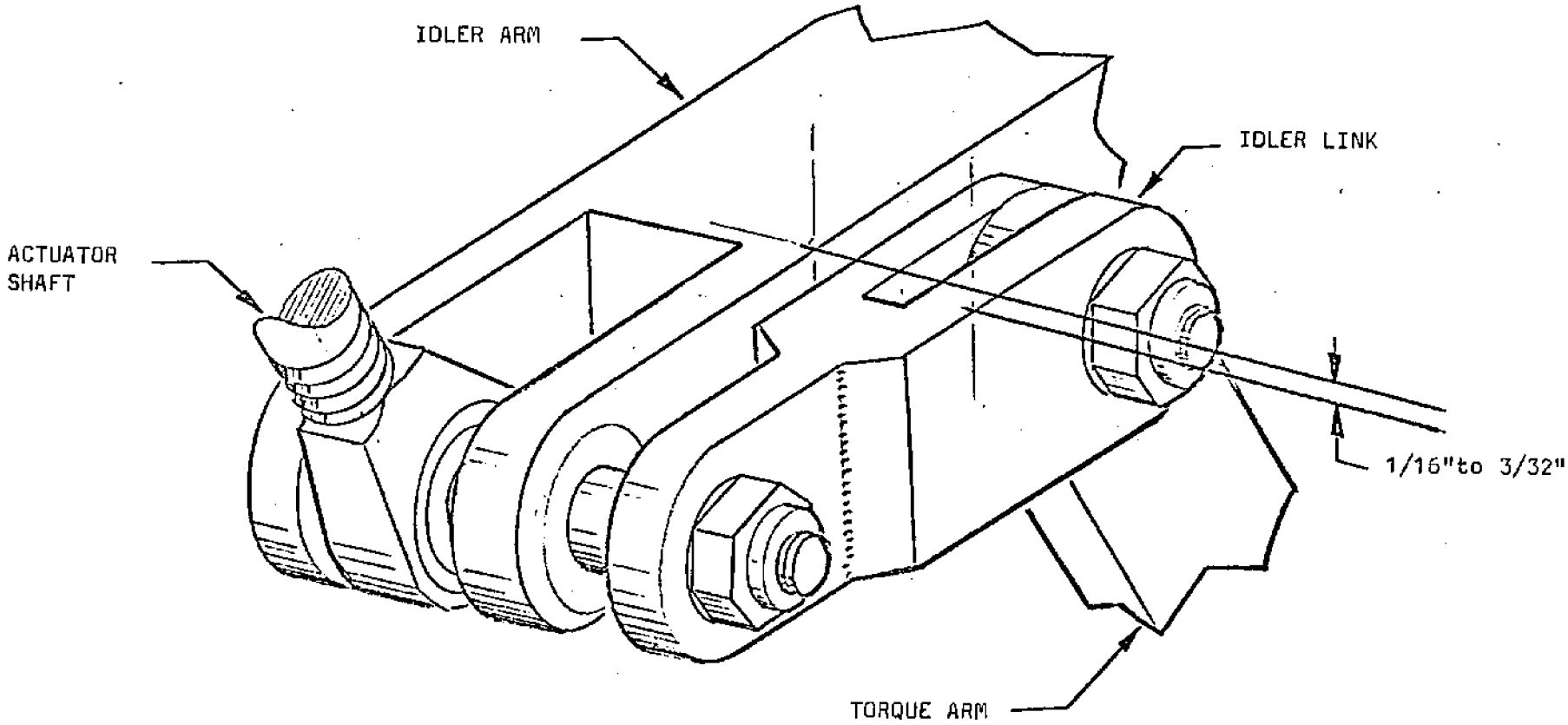

Figure 3-1. The past center lock mechanism.

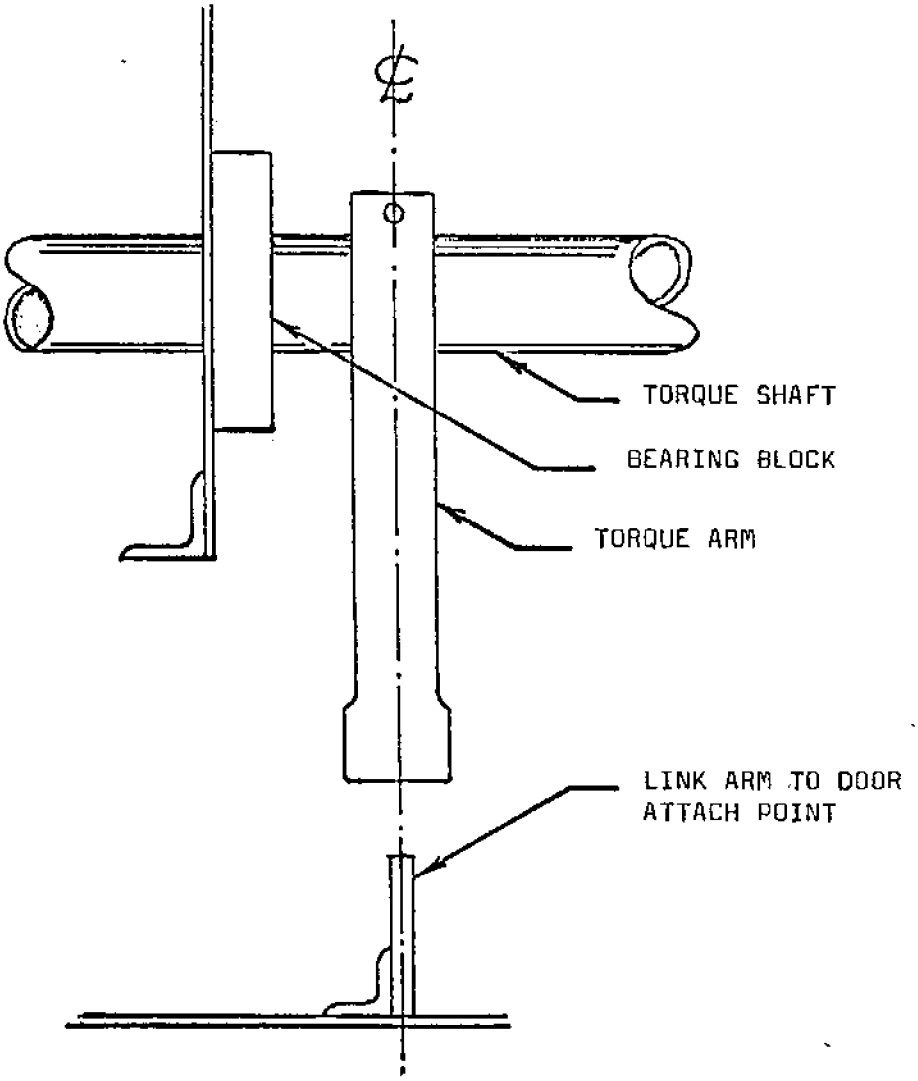

Figure 3-2. Torque arm and door alignment.

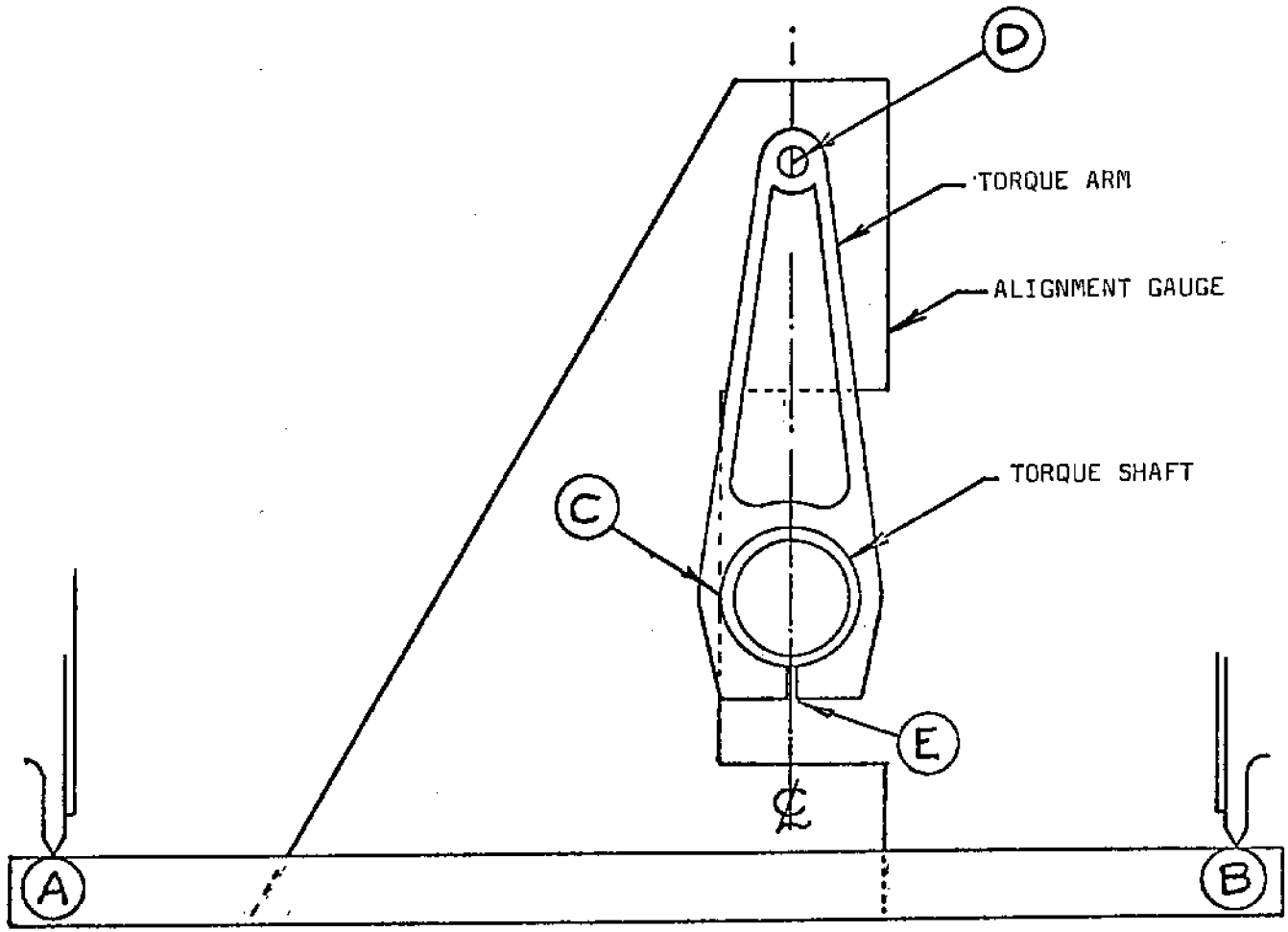

Figure 3-3. Use of gauge to center torque arms on shaft

D. Rotate the torque shaft to the fully closed position, making sure that the cylinder is fully extended and that the past center locking mechanism is engaged. Bind the mechanism in this position to assure that movement does not occur.

E. With a suitable torque arm alignment gauge, such as is shown in Figure 3-3, check the arms for angular alignment. The tool should make firm contact with both tank seal flanges, as shown at (A) and (B) and to the torque shaft, as at (C), checking to see that the center line scribed on the gauge is centered on the torque arm bolt hole, as shown at (D).

F. If adjustment is required, loosen the torque arm clamping bolt(s). Align the torque arm(s) as required and retighten the bolt(s) to 225 inch pounds of torque.

G. Reassemble the loor links.

In manufacturing the alignment gauge, it is essential that the centerline, shown in Figure 3-3, is established perpendicular to a line drawn from points (A) and (B). You may find it convenient to use a straight length of angle to establish this reference plane.

It is also important that the cutout used to establish the torque tube contact point, shown at (C), be carefully made. Index the cutout edge a distance equal to 1/2 of the torque tube diameter from the centerline. For practical purposes, the tubes will be found to measure 1.90 inches in diameter.

3.6 ADJUSTMENT OF DOOR SEAL PRELOAD; TO STOP SMALL LEAKS

To increase the sealing effort in a localized area, proceed as follows:

A. Determine the source of the leak.

B. Open the door and check the rubber seal for freedom from foreign particles. See that the metal sealing edge is free from nicks.

C. To increase the depth of seal edge penetration, loosen the clamping bolt(s) common to the door links and ribs, in the area needing attention, and relocate the bolt(s) and bushings assembly closer toward the door skin. Retorque to 300 inch pounds.

3.7 ADJUSTMENT OF DOOR SEAL PRELOAD; TO STOP LARGE LEAKS

To increase the sealing effort for an entire door, proceed as follows:

A. With the door shut, see that the past center locking mechanism is properly set, as described under Paragraph 3.3.

B. Open the door.

C. Loosen all the clamping bolts common to the ribs and links.

D. Slide the bolt-bushing assemblies to the bottom of the slots. (Towards the door skins). Torque all bolts to 40-50 inch pounds.

E. Gently close the door, using a suitable mechanical lever.

F. Gently open the door, as above.

G. The above actions will have caused the clamping assemblies to slip to a static load position. Mark the position of each clamp with a pencil; applying the reference marks to the door ribs.

H. Loosen each clamping bolt and slide the assemblies toward the door skin a distance of approximately 3/32nds of an inch. Torque the bolts to 300 inch pounds.

I. Close the door hydraulically, making sure the past-center locking mechanism engages as it should.

J. Fill the tank with water and check for leaks. Re-adjust as necessary.

3.8 TUNING THE FILLER SYSTEM

In order to be able to compensate for varying conditions in the field that otherwise could cause the four sections of the tank to fill at different rates, a means of adjusting the filling rates of the four sections has been built into the filler system.

Simply stated, the tuning system is a manifold incorporating four variable resistance valves, spring loaded in the closed position.

Should field observations show one or more tank section leading the others in rate of filling, the relative rates of filling can be adjusted by increasing or decreasing the spring tension at the valve(s).

4.0 TROUBLE SHOOTING THE SYSTEM

4.1 CANNOT OBTAIN A GREEN "GO" LIGHT

A. Check electrical power.

B. Check circuit breakers.

C. Press to test "GO" light bulb.

D. Check Arming Switch.

E. Check that system hydraulic pressure is at least 1,000 P.S.I. If using the auxiliary pump, be sure that Stand-By Inverter Switch is on.

F. Check emergency dump de-arm switch.

G. Check "GO" system "Meletron" pressure switch, located on junction panel. See Figure 4-1.

4.2 DOORS (ALL) WON'T OPEN

A. Check for "GO" light.

B. Check tank disconnect cannon plug.

C. Check cannon plug connections to 4-way valves.

D. Check Control and Auto-Hold relays located in relay box on junction panel. See Figure 4-1.

NOTE: RELAY BOX SHOWN WITH COVER REMOVED.

WIRING OMITTED FOR CLARITY.

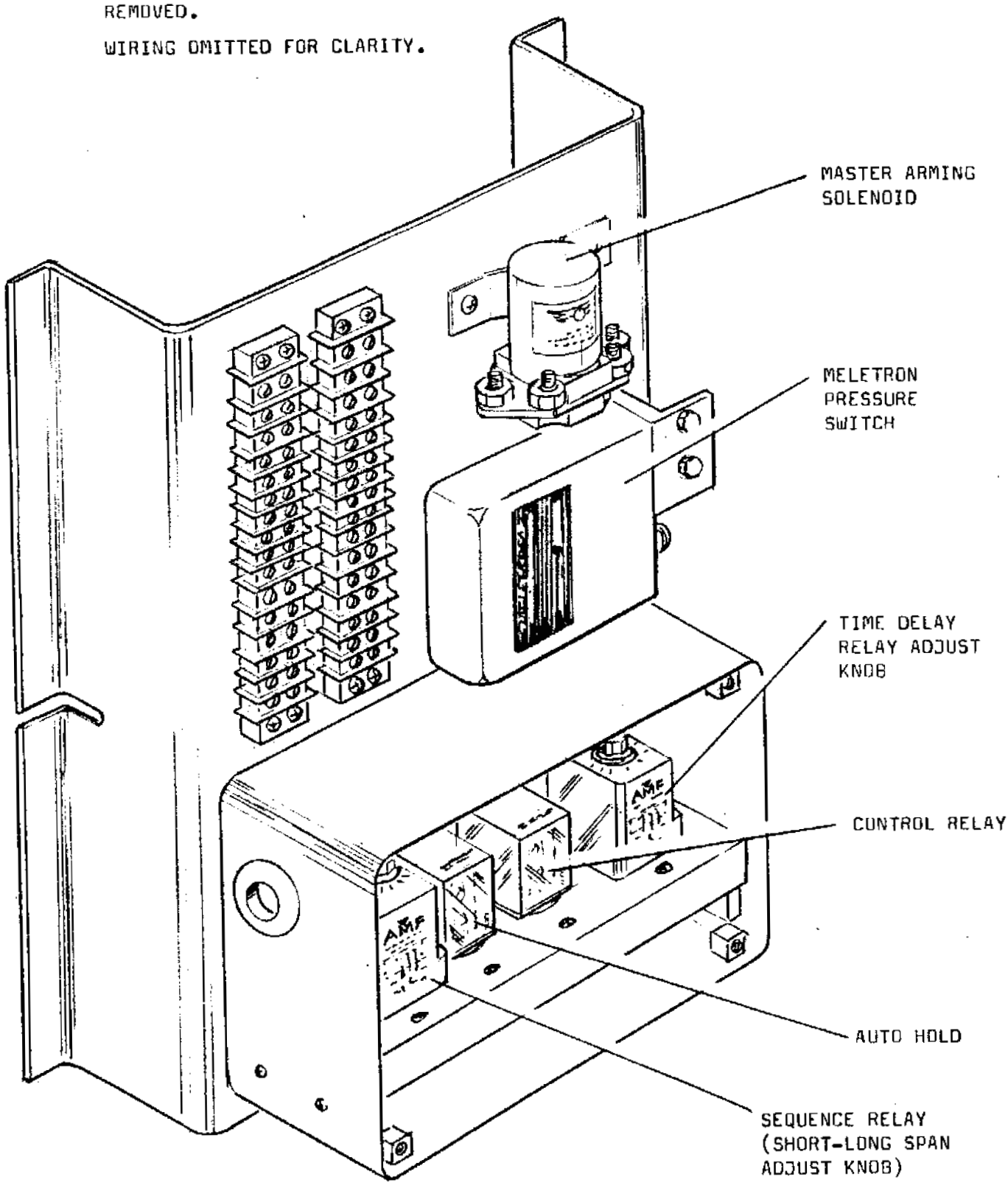

Figure 4-1. Junction box and relay panel.

E. Check Drop Button leads for a grounded switch; the Control relay should respond to each Drop Button action. See Figure 4-1.

4.3 ONE OR MORE DOORS WON'T OPEN ON COMMAND

A. Check for "GO" light.

B. Attempt to open the door(s) in question by use of the manual over-ride button(s) on the valve assemblies. If the door(s) open:

1. Check cannon plug on 4-way valve.

2. Check for obvious wiring breaks, particulary in area of splices.

3. If the Drop Selector is skipping a door; failing to send a signal to the valve assembly, check the sequence relay for proper setting. See Figure 4-1.

4. If the door(s) still won't open electrically, it may be necessary to replace the 4-way valve assembly.

C. If the door(s) won't open manually:

1. Check for binding linkage or other obstruction.

2. Check 2-way restricter for blockage.

3. Check for failure of 4-way valve.

4.4 DOORS WON'T OPEN FULLY

A. Check for "GO" light.

B. Is the Drop Button being firmly pushed and held down for at least one second?

C. Door closing time delay relay may be set too fast; not allowing doors to open fully before immediate closing. Check and adjust the relay.

D. Check for internal leakage situation on 4-way valve or actuating cylinder.

4.5 DOORS (ALL) WON'T CLOSE

A. Check for "GO" light.

B. Check tank disconnect cannon plug.

C. Check all electrical power connections.

D. Check time delay relay. See Figure 4-1.

4.6 ONE OR MORE DOORS WON'T CLOSE

A. Check for "GO" light.

B. Attempt to close the door(s) in question by use of the manual over-ride button(s) on the valve assemblies. if the door(s) close:

1. Check cannon plug on 4-way valve.

2. Check for obvious wiring breaks, particulary in area of splices.

3. Check limit switches for positive actuation.

4. If the door still won't close electrically it may be necessary to replace the 4-way valve assembly.

C. If the door(s) won't close manually:

1. Check for binding linkage or other obstruction.

2. Check 2-way restricter for blockage.

3. Check for failure of 4-way valve.

4.7 ONE OR MORE DOORS OPEN AND CLOSE NORMALLY BUT POP OPEN AFTER CLOSING AND CONTINUE CYCLING

A. The mechanical linkage may not be going past center.

4.8 DOORS OPEN TOO SLOWLY AND CLOSE TOO FAST

A. Check for reverse installed 2-way restricter.

4.9 THE DOORS STAY OPEN LONGER THAN 3 SECONDS

A. The door opening timer delay relay is either faulty or out of adjustment. See Figure 4-1.

4.10 IN AUTOMATIC OPERATION, THE TIME INTERVALS BETWEEN DOOR OPENINGS IS TOO LONG OR TOO SHORT AND CANNOT BE CORRECTED BY ADJUSTMENT OF THE SLOW-FAST SWITCH

A. Check sequence relay for adjustment or failure.

4.11 DOOR OPEN LIGHT STAYS ON AFTER THE DOOR IS CLOSED

A. The door limit switch is not being actuated.

B. The limit switch is defective.

4.12 DOOR OPEN BUT NO DOOR LIGHT COMES ON

A. Press to test bulb.

B. Check tank disconnect cannon plug.

C. The limit switch is defective.

4.13 EMERGENCY SYSTEM ACTIVATED AND ONE OR MORE DOORS WON'T OPEN

A. Check for pressure in emergency nitrogen supply bottle.

1. Loss of air in system can occur as a result of leaking valve or fittings.

B. Check system for jammed shuttle valve(s).

4.14 EMERGENCY SYSTEM IS ACTIVATED AND HYDRAULIC FLUID IS VENTED THRU DUMP VALVE

A. As a result of numerous emergency activations, hydraulic vapor will condense and bleed through the dump valve.
NOTE: See maintenance instruction Paragraph 3.2.

4.15 NORMAL SYSTEM ACCUMULATOR PRE-CHARGE WILL NOT HOLD PRESSURE

A. Check external loss in ground service point and line fittings.

B. Failure to detect any external leakage will isolate air loss to inside of accumulator.