CHAPTER 7

HYDRAULIC AND PNEUMATIC SYSTEMS

Section I. HYDRAULIC SYSTEM

7-1. HYDRAULIC SYSTEM.

NOTE

The use of any alcohol in cleaning components which contact hydraulic fluids is prohibited. Formation of a polymeric residue can result which could impair mechanical operation of the components.

NOTE

All preformed packings and threads will have a light film of hydraulic fluid (C130) or (C131) applied prior to assembly. Ensure that parts are clean.

7-2. Description — Hydraulic System. a. The flight control hydraulic system provides power to operate flight control power cylinders. A gravity feed reservoir is used. The basic system includes a variable delivery axial-piston pump, reservoir, filter, relief valve, solenoid valve, directional flow check valves, servo valves, irreversible valves, power cylinders, pressure switch, low pressure caution light, couplings for connection of a ground test stand and connecting lines and a control switch located on the pedestal (figure 7-1).

b. The pump is located on the transmission sump case and is accessible through a removable panel on right side of pylon island. Access to the gravity feed reservoir is by opening transmission fairing on cabin roof. The ground test stand couplings are located in the engine compartment on the right side.

c. Additional equipment for helicopters with provisions for external stores includes a solenoid valve in the pressure line, a filter and check valve in the return line, and couplings with quick-disconnect fittings for connection of external stores and armament. The components are located in the pylon aft of the basic system equipment. The external stores couplings are located on the right and left sides of the fuselage just above the landing skid attachment points.

7-3. Operation — Hydraulic System. a. System pressure (figure 7-2) of 950 to 1000 psig is produced by the variable delivery, pressure compensated pump, mounted on the main transmission and driven at 0.65 engine drive shaft speed. Fluid is drawn from the resevoir by the hydraulic pump and pumped to the system through a check valve and a filter to a normally-open, solenoid-operated system shutoff valve. When the HYD CONTROL switch is ON, this valve is open and system pressure is supplied to all four of the flight control power cylinders. Each power cylinder assembly includes a servo valve which is mechanically controlled by the flight control linkages. When the linkage moves any servo valve control lever down, the cylinder retracts and when the linkage moves the lever up the cylinder extends. When the lever IS centered, system pressure is applied equally to both sides of the cylinder piston but the system return port is shut off and cylinder does not move in either direction. Irreversible valves are provided for each main rotor power cylinder to prevent feedback. When system pressure drops to approximately 500 psi, a spring loaded sequence valve (view A), sheet 2 in the irreversible valve closes and blocks both the system pressure and system return ports trapping fluid under 500 psi in the power cylinder servo valve and irreversible valve. Each irreversible valve incorporates a check valve to isolate surge pressure produced in the power cylinders from the system pressure lines. A differential relief valve opens automatically to relieve pressures in excess of 500 psi differential. The irreversible valves also incorporate another feature which allows the power cylinders to be operated manually. The same function is performed by the check valve which interconnects the system pressure line to the system return line adjacent to the tail rotor power cylinder. When no system pressure is available and the power cylinders are operated manually, fluid flows directly through the irrevers-

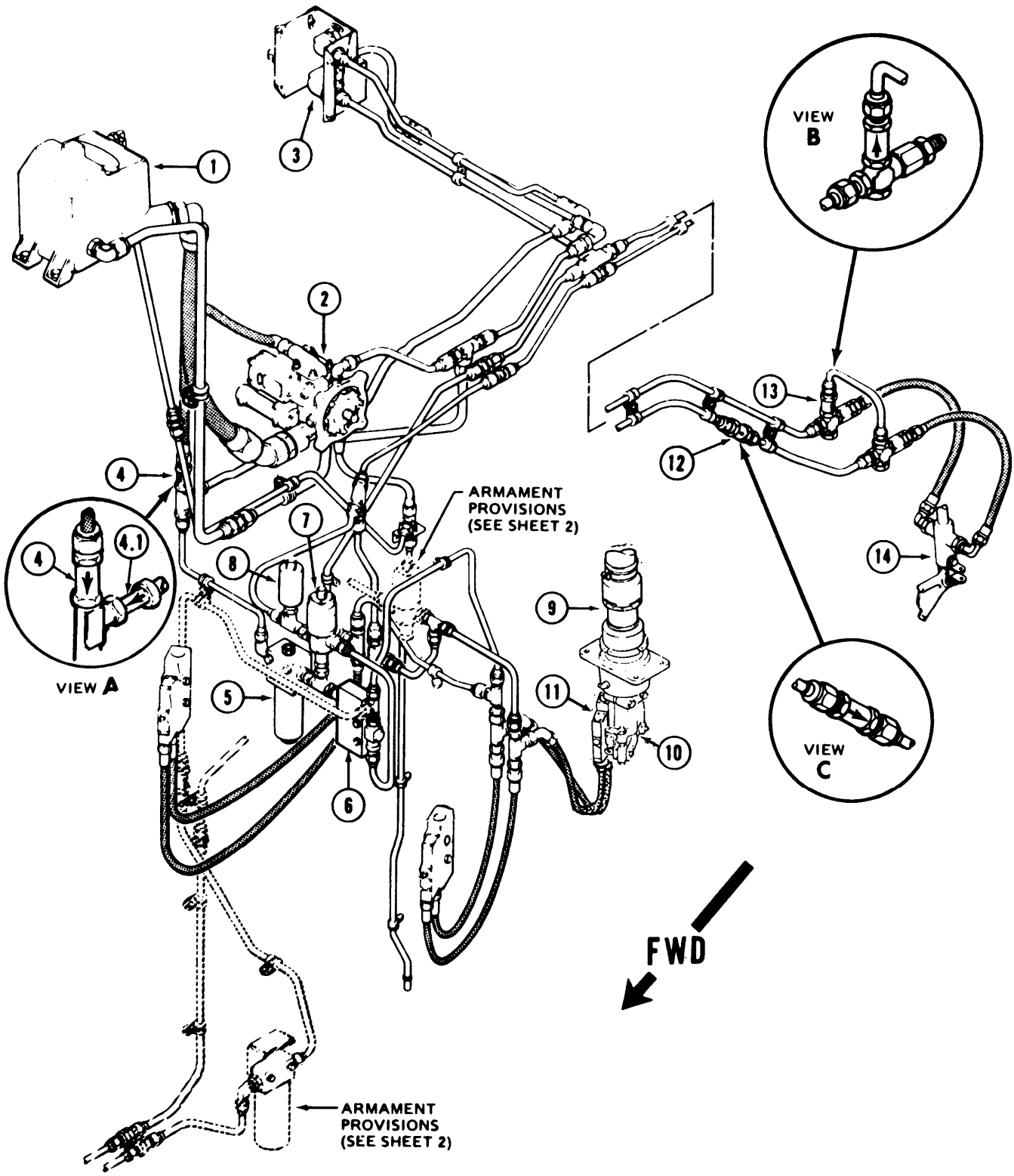
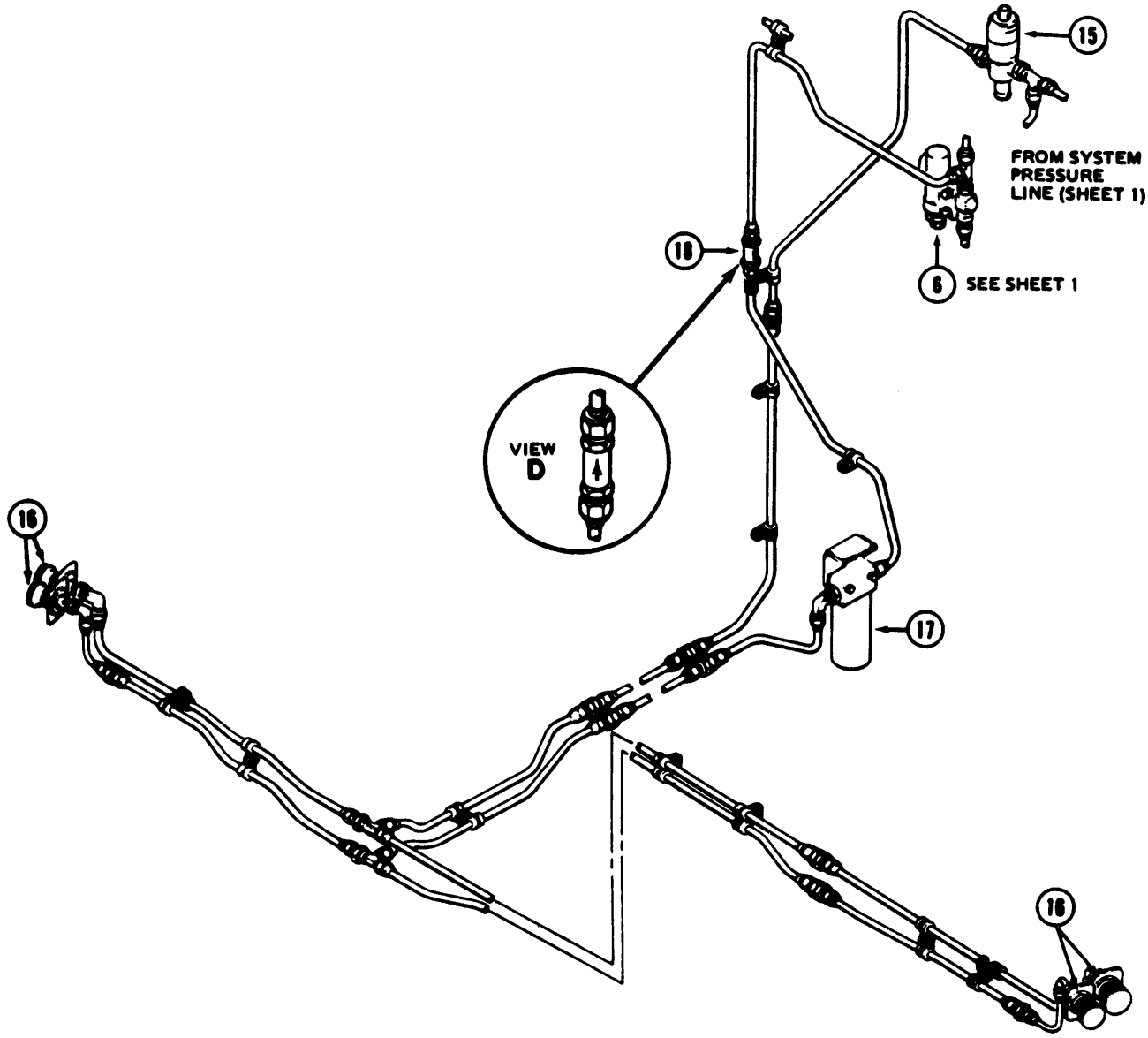


Figure 7-1. Hydraulic System — Flight Controls (Sheet 1 of 2)

ible valve or the tail rotor check valve from the cylinder return part to the cylinder pressure. Hence the cylinder pumps fluid from one side of the piston to the other without attempting to pump fluid through the entire system. The pressurized reservoir hydraulic system is no longer approved for use in UH-1 helicopters.

b. A line-mounted pressure switch is provided in the system pressure line to sense the system pressure. The switch closes a circuit to the caution



1. Reservoir
2. Pump
3. Test couplings
4. Check valve
4.1. Check valve
5. Filter
6. Relief valve
7. Solenoid valve
8. Pressure switch
9. Power cylinder (typical three places)
10. Servo control valve
11. Irreversible valve
12. Check valve
13. Check valve
14. Tail rotor cylinder valve
15. Armament shutoff solenoid valve
16. Couplings for external armament
17. Armament line filter
18. Check valve

Figure 7-1. Hydraulic System — Flight Controls (Sheet 2 of 2)

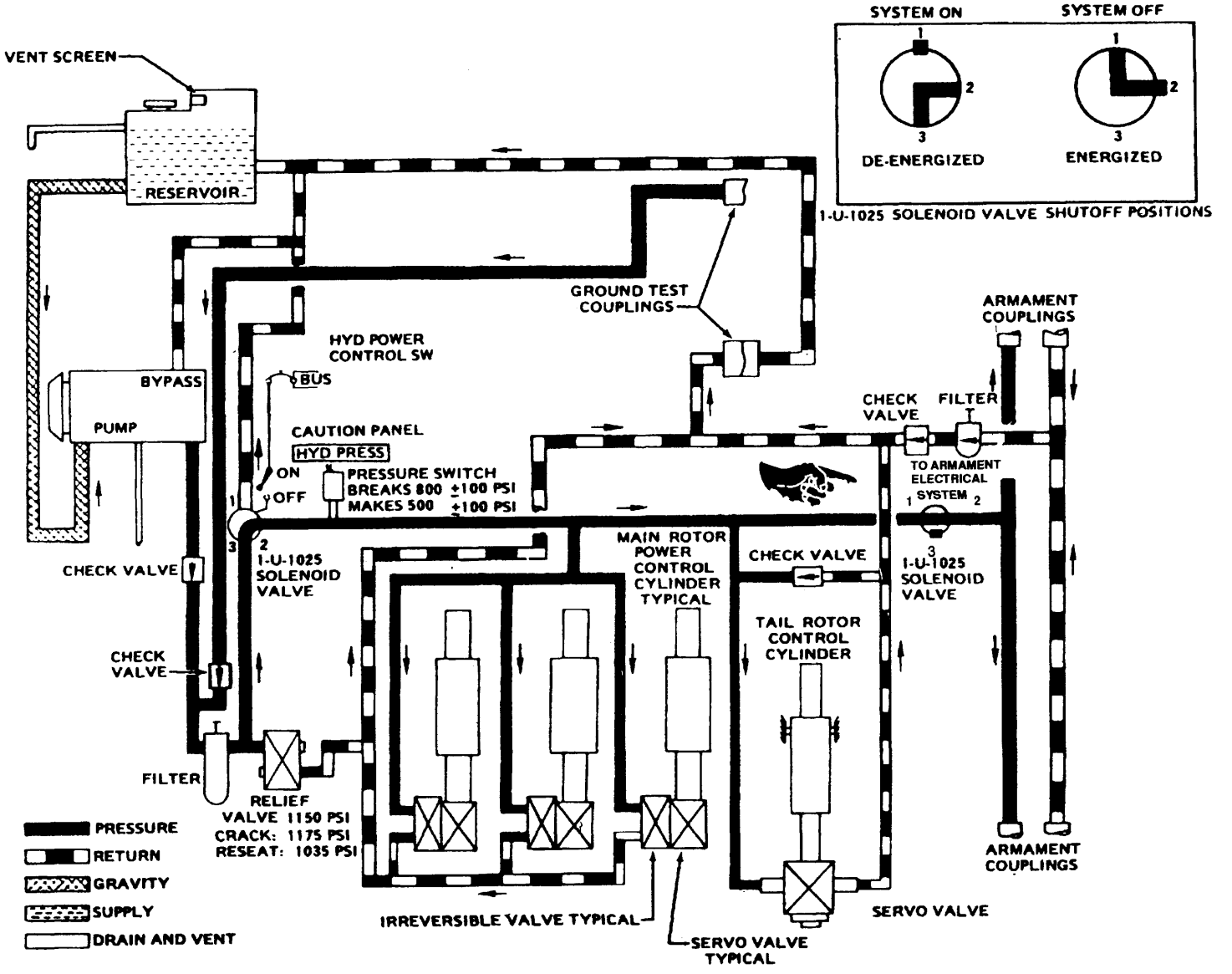


Figure 7-2. Hydraulic System Schematic (Gravity Feed) (Sheet 1 of 2)

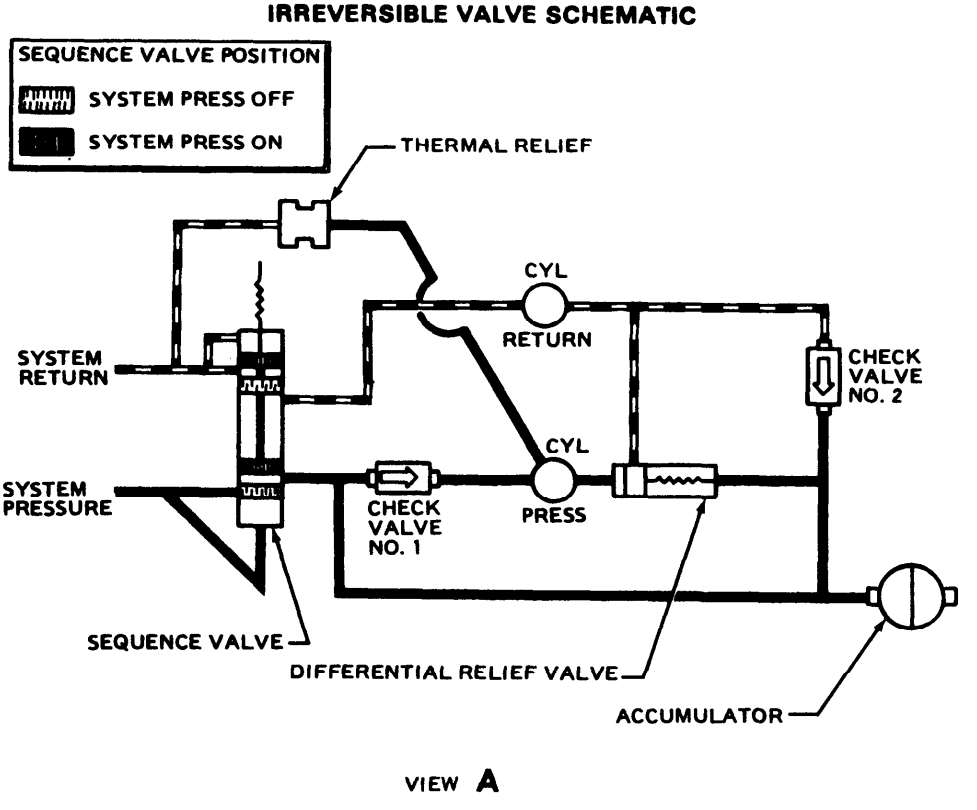


Figure 7-2. Hydraulic System Schematic (Gravity Feed) (Sheet 2 of 2)

panel when the system pressure drops below 400 psig and causes the **HYD PRESSURE** caution light and the **MASTER CAUTION** light to be illuminated. When pressure is increasing, the switch should open at 900 psig maximum.

c. On helicopters, serial nos. 63-12956 thru 65-10135, 65-12773 thru 65-12776, 65-12847 thru 65-12852, and 65-12857 thru 65-12895, with provisions for externally mounted armament, pressure is supplied to a normally-open solenoid valve which is controlled by a switch on an armament control panel. When the valve is open, hydraulic fluid is supplied to the external couplings on each side of the helicopter. When external hydraulic equipment is connected, fluid used to operate the equipment is returned through a filter and check valve to the hydraulic reservoir.

d. The following provides guide lines for allowable external leakage of in-service hydraulic system components, and some methods of measuring such leakage.

(1) Scope — Limits described are only for components in service in helicopter hydraulic systems. Intent is to minimize replacement of hydraulic components which are still serviceable.

(a) These limits may differ from those contained in various military specifications for components, which are intended to control quality, assembly, and proper functioning of the components for procurement. Components in service sometimes develop leakage rates in excess of specification limits, without necessarily becoming detrimental to the system or failing to provide reliable operation.

(b) These limits are not to be used as basis for acceptance or rejection of components of any bench functional test or systems on new helicopters.

(c) These limits are not applicable to self-contained closed-compartment hydraulic units such as viscous dampers, liquid springs, or oleo struts.

(2) Causes of Leakage — Some seepage is normally present, since static or dynamic seals are not functionally perfect, due to such causes as follows: