# FAULT DIAGNOSIS
## Vacuum/Hydraulic system

| *Symptom* | *Possible Cause* | *Rectification* |
|---|---|---|
| **FALL OF FLUID LEVEL IN MASTER CYLINDER RESERVOIR** | 1. Normal friction pad/brake lining wear. | Top up the fluid reservoir to the correct level, then check daily for the next few days. If the level again falls significantly carry out the procedure for "hydraulic fluid leak". |
| | 2. Hydraulic fluid leak. | Visually check the hydraulic connections for leaks, including the master cylinder, calipers, wheel cylinders, and the load sensing valve, where necessary peeling back the rubber boots. Tighten any loose connections found, but if the leak persists the suspect component or assembly must be repaired or replaced. |
| **EXCESSIVE TRAVEL OF THE FOOTBRAKE PEDAL OR HANDBRAKE LEVER** | 1. Failure of one circuit in dual line braking system. | Carry out procedure for "hydraulic fluid leak" to isolate fault. If no leak is apparent dismantle the master cylinder, if the bore and pistons are in perfect condition service the assembly using the appropriate repair kit, otherwise replace the complete master cylinder. |
| | 2. Excessive 'run out' of brake disc caused by worn or out of adjustment wheel bearings. | Renew or adjust the wheel bearings as specified in the relevant section. Disc run out can sometimes be improved by refitting the disc in alternative positions on the hub. Ideally disc run out should not exceed a dimension of 1.15mm (.006"). |
| | 3. Drum brakes (manual adjusting) out of adjustment. | Adjust the brakes, apply pedal to centralise shoes then recheck for correct adjustment. |
| | 4. Handbrake cable out of adjustment or inoperative rear brake auto adjusting mechanism. | Adjust the handbrake cable as detailed in the relevant section. If the fault persists, remove the brake drums and check that the automatic rear adjusters are functioning correctly. Rectify as necessary. |
| **SPONGY BRAKE PEDAL** | 1. Fluid level drop in master cylinder reservoir allowing air to enter hydraulic system. | Thoroughly bleed the system, refill reservoir to the correct level and carry out procedure for "hydraulic fluid leak". |
| | 2. Faulty rubber brake hose. | Check all hoses for leakage or ballooning under pressure. Replace any defective hoses as necessary. |
| **FADE** | 1. Incorrect adjustment. | Check/adjust shoe to drum clearances. |
| | 2. Incorrect friction material. | Change pads and/or shoes. |
| | 3. Primary/secondary shoes interchanged. | Remove and refit correctly. |
| | 4. Drum worn. | Fit new brake drum. |

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| **BRAKE DRAG (All Brakes Drag)** | 1. Mechanical – Binding or obstructed brake pedal. | Check that the footbrake pedal returns fully and freely to the "off" position and is not obstructed, for example, by an incorrectly adjusted stop light switch. |
| | 2. Hydraulic – pressure build-up in master cylinder. | Slacken the tube nuts at the master cylinder, if this releases the brakes there may be contaminated brake fluid in the system causing the rubber components to swell blocking the by-pass ports and trapping hydraulic pressure. Refer to "rectification" below. |
| | 3. Rubber cups or seals swollen due to brake fluid contamination by petrol, paraffin or mineral oil, etc. | Contamination may sometimes be confirmed by the characteristic smell in the fluid reservoir. Although the degree of swelling is relative to the severity of contamination, when withdrawn from the cylinder, usually the swollen rubber seals may be easily recognised as oversize. All rubber parts such as cups, seals and flexible hoses must be changed. Thoroughly flush the system before fitting the new parts. |
| **BRAKE DRAG (A Particular Brake Drags)** | 1. Disc pads seized or sticking in a caliper recess. | Withdraw the pads and shims then thoroughly clean the caliper recess with a damp rag. Do not blow out with an airline it could be harmful to inhale the dust. Clean all dirt from the pads and lightly smear the back of the steel backing plates with Lockheed Disc Brake lubricant carefully avoiding the friction material. Refit the pads and check that the disc revolves freely. |
| | 2. Seized piston(s) in disc brake caliper or wheel cylinder. | Remove the disc pads or brake drum as applicable, then carefully depress the foot brake pedal to check movement of the piston(s) in the suspect assembly. If a piston is seized the complete caliper or wheel cylinder assembly must be replaced. |
| | 3. Obstruction in a flexible brake hose. | Isolate the fault, disconnect brake hose to confirm complaint then renew the defective brake hose. |
| | 4. Incorrect adjustment or seizure of the handbrake assembly. | Examine the handbrake cable, clevis pins and yokes etc., also the handbrake mechanism at the backplate, if necessary removing the brake drum to confirm correct operation. Adjust the handbrake as necessary. |
| | 5. Weak or broken brake shoe pull-off springs. | remove the brake drum and carefully examine the assembly. If "possible cause" is confirmed replace defective spring(s). |

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| **UNBALANCED BRAKING WITH PULL OR JUDDER** | 1. Disc pads or shoe linings contaminated with oil, grease or hydraulic fluid. | Examine the pads or shoes to confirm complaint then establish the cause of contamination and rectify by replacing any defective parts. A minor degree of friction material contamination may be removed with fine emery cloth, but at the same time moisten with a damp rag, it could be harmful to inhale the dust Otherwise if contamination is severe the disc pads or brake shoes must be replaced in sets irrespective of their state of wear. |
| | 2. Different grades of friction pad/lining material used as an axle set. | Remove the disc pads or brake shoes and check that the friction material is not of different grades. Otherwise replace the pads or shoes in complete axle sets. |
| | 3. Seized piston(s) in disc brake caliper or wheel cylinder. | Remove the disc pads or brake durm as applicable, then carefully depress the foot-brake pedal to check movement of the piston(s) in the suspect assembly. If a piston is seized, the complete caliper of wheel cylinder assembly must be replaced. |
| | 4. If associated with mudder, surface condition and run out of discs, or excessive run out or distortion of brake drums. | Minor disc friction surface imperfections may be removed with fine emery cloth, if in doubt replace disc. Check the disc run out which ideally must not be more than 0.15mm (0.006"). Ensure that the wheel bearings are not worn or out of adjustment, replace or adjust as necessary. Check and compare the thickness of the disc at various points around the friction surface, if a thick/thin condition is confirmed replace the disc. Rear brake drum judder may be detected by gently applying the handbrake at low speed. |
| | 5. Loose caliper mounting bolts, loose backplate, steering and suspension components, tyre pressures. | Check the security of the brake assemblies and for wear on the steering and suspension parts, also ensure that the tyres are of the correct type in good condition and at the recommended pressures. |
| **BRAKES INEFFICIENT GIVING INCREASED BRAKE PEDAL EFFORT** | 1. Servo unit inoperative. | With the engine "off" depress the brake pedal several times to exhaust all vacuum from the servo unit, during this operation the air control valve should hiss everytime the pedal is pressed. With all vacuum gone, apply light pressure to the brake pedal and restart the engine, if the servo is working the pedal will appreciably sink down as the servo operates. With the brakes held on there should be no hiss from the air inlet. These tests are not exhaustive therefore if the servo unit gives cause for doubt as to its performance it is adviseable to replace the unit. |
| | 2. Air in system. | Bleed system. |
| | 3. Load sensing valve incorrectly set or faulty operation. | Check/adjust setting. Check operation. |

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| **BRAKES INEFFICIENT (Cont'd.)** | 4. Glazed or worn out friction pads or brake shoes. | Glazed surfaces on pads or shoes can be carefully removed by rubbing down with rough sandpaper, but at the same time moisten with a damp rag, it could be harmful to inhale the dust. Otherwise if worn down to the stated limits replace the pads or shoes. |
| | 5. Damaged or rusty friction surface of brake disc. | Examine the brake discs for cracks, scoring, or a rust deposit which after being subjected to heat by the pads gives the friction surface a black appearance. Minor surface imperfections may be removed with fine emery cloth but such faults if severe render the disc inefficient, therefore if any doubt exists renew the part. |
| | 6. Disc pads or shoe linings contaminated with oil, grease or hydraulic fluid. | Examine the pads or shoes to confirm complaint the establish the cause of contamination and rectify by replacing any defective parts. A mino degree of friction material contamination may be removed with fine emery cloth, but at the same time moisten with a damp rag, it could be harmful to inhale the dust. Otherwise if contamination is severe the disc pads or brake shoes must be replaced in sets irrespective of their state of wear. |
| | 7. Seized piston(s) in disc brake caliper or wheel cylinder. | Remove the disc pads or brake drum as applicable, then carefully depress the footbrake pedal to check movement of the piston(s) in the suspect assembly. If a piston is seized the complete caliper or wheel cylinder assembly must be replaced. |
| **DISC BRAKE SQUEAL** | 1. High frequency pad vibration. | Withdraw the friction pads, also if fitted the shims. Lightly smear the shims and the metal backplate and edges of the pad with Lockheed Disc Brake lubricant. Do not allow the lubricant to contaminate the friction material. Refit the pads. |
| | 2. Loose caliper mounting bolts. | Confirm this possible cause then rectify by tightening mounting bolts to the correct torque figure. |
| **DRUM BRAKE SQUEAL** | 1. Lack of lubrication and/or excessive lining dust in brake assembly. | Remove the brake drum, then the shoes and other parts and clean the assembly. Do not blow out with an airline it could be harmful to inhale the dust, but remove with a vacuum cleaner or wipe clean with a damp rag. Lightly smear with Lockheed Expander lubricant the tips of the shoes. |
| | 2. Back plate loose | Tighten to correct torque |
| | 3. Wheel cylinder loose. | Tighten to correct torque. |