CHAPTER

27

FLIGHT CONTROLS

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GENERAL

DESCRIPTION AND OPERATION

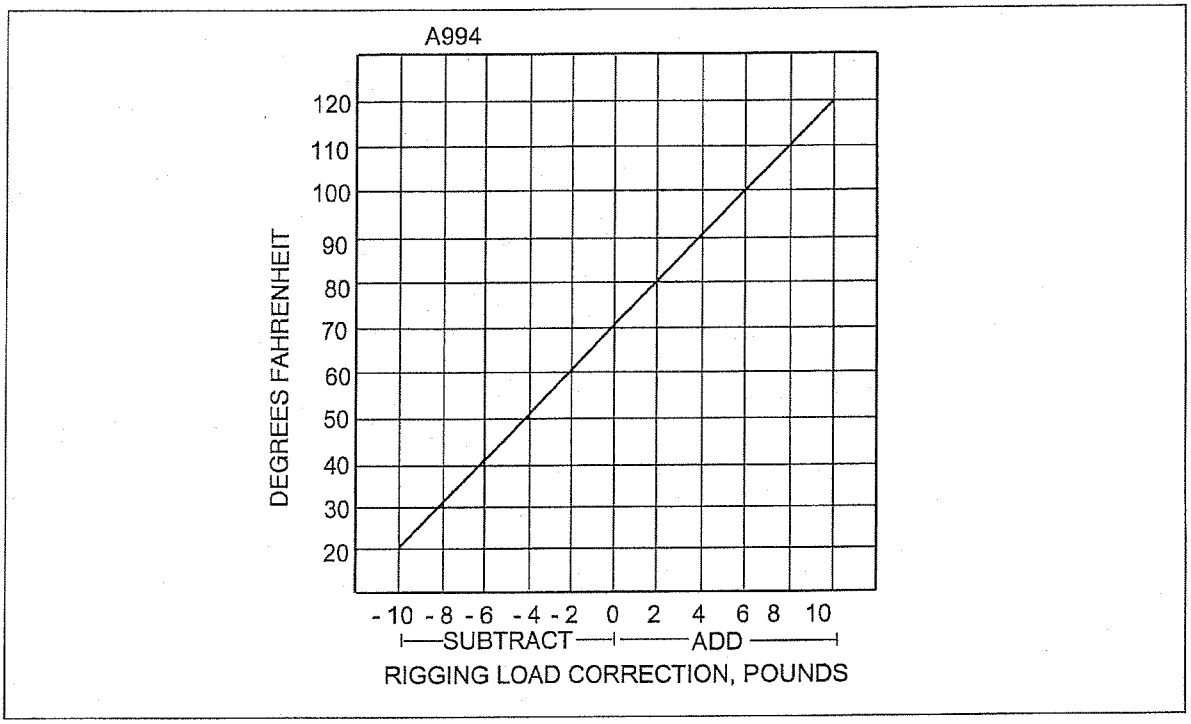
The airplane is controlled in flight by the use of three primary control surfaces, consisting of ailerons, stabilator, and rudder. Operation of these controls is through the movement of the control column-tee bar assembly and rudder pedals. On the forward end of each control column is a sprocket assembly. A chain is wrapped around the sprockets to connect the right and left controls and then back to idler sprockets on the column's tee bar, which in turn connect to the aileron primary control cables. The cables operate the aileron bellcrank and push-pull rods. The stabilator is controlled by a cable connected to the bottom of the tee bar assembly and operates an aft fuselage bellcrank which controls a push rod connected to the balance arm of the stabilator. Cables also connect the rudder pedals with the rudder horn. Provisions for directional and longitudinal trim control is provided by an adjustable trim mechanism for the stabilator and rudder. The stabilator trim is controlled by a wheel and drum mounted on the floor tunnel between the front seats. Cables routed aft from the drum to a screw assembly mounted above the stabilator attachment point. This screw assembly in turn moves the push rod which controls the stabilator trim tab. The rudder trim is controlled by a knob and screw assembly attached to the rudder pedal assembly. The flaps are mechanically operated on early models and electrically operated on 1985 models.

STANDARD PROCEDURES

The following tips may be helpful where applicable in the individual control system procedures.

1. Turnbuckles must be assembled and adjusted in a manner that each terminal end is screwed an approximately equal distance into the barrel. During adjustment, the terminals must not be turned in a manner which would put a permanent twist in the cable.
2. After adjustment is complete, each turnbuckle must be checked. Not more than three terminal threads shall be visible outside the barrel. Locking clips must be installed and checked for proper installation by trying to remove the clips using fingers only. Locking clips which have been installed and removed must be scrapped and new clips used.
3. Torque all nuts in the flight control surface rigging system in accordance with AC 43.13-1A or to torques specified within this manual text.
4. After completion of adjustment, each jam nut must be tightened securely and inspected.
5. On push rods or rod ends provided with an inspection hole, the screw must be screwed in sufficiently far to pass the hole. This can be determined visually or by feel, by inserting a piece of wire into the inspection hole. If no inspection hole is provided, a minimum of .375 of an inch thread engagement must be maintained.
6. All cable rigging tensions given must be corrected to ambient temperature in the area where the tension is being checked by using Chart 2702.
7. See Figure 27-1 for the proper method of adjusting rod ends to prevent possible damage and binding of bearing surface in rod end.
8. All pulley guard pins should be properly installed.

CHART 2701. CABLE TENSION VS. AMBIENT TEMPERATURE



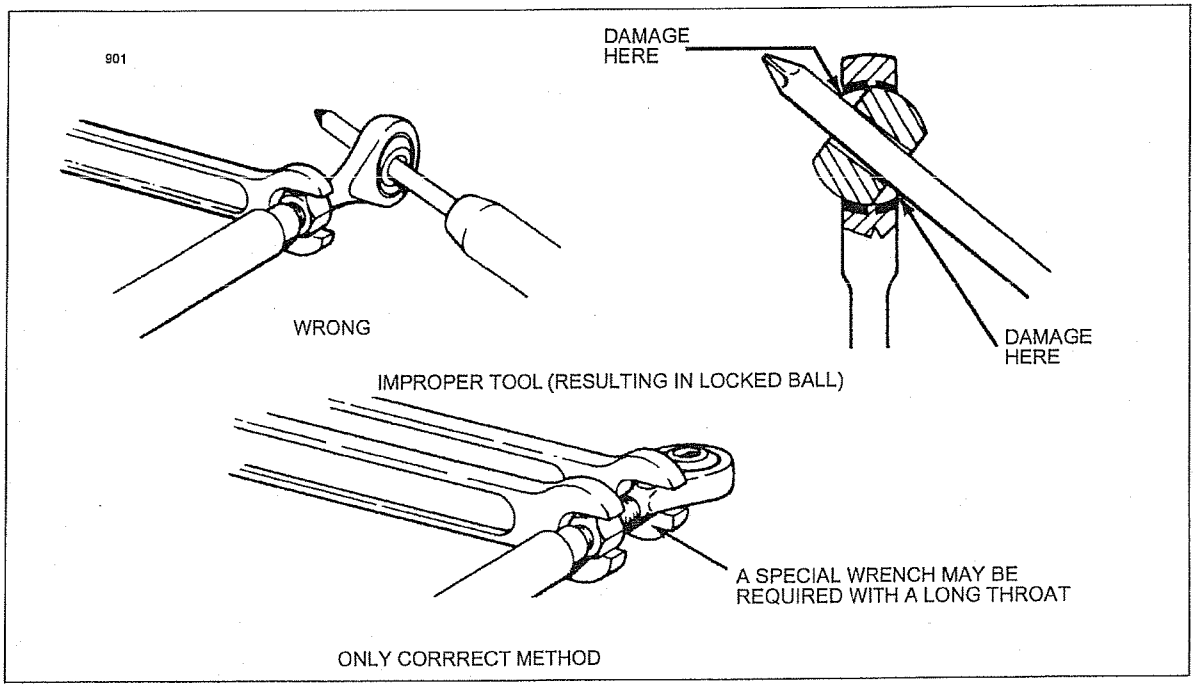


Figure 27-1. Rod End Installation Method

CONTROL CABLE INSPECTION

Aircraft control cable systems are subject to a variety of environmental conditions and forms of deterioration that, with time, may be easy to recognize as wire/strand breakage or the not-so-readily visible types of wear, corrosion, and/or distortion. The following data may help in detecting the presence of these conditions:

Cable Damage

Critical areas for wire breakage are sections of the cable which pass through fairleads and around pulleys. To inspect each section which passes over a pulley or through a fairlead, remove cable from aircraft to the extent necessary to expose that particular section. Examine cables for broken wires by passing a cloth along length of cable. This will clean the cable for a visual inspection, and detect broken wires, if the cloth snags on cable. When snags are found, closely examine cable to determine full extent of damage.

The absence of snags is not positive evidence that broken wires do not exist. Figure 270-2A shows a cable with broken wires that were not detected by wiping, but were found during a visual inspection. The damage became readily apparent (Figure 27-2B) when the cable was removed and bent using the techniques depicted in Figure 27-2C.

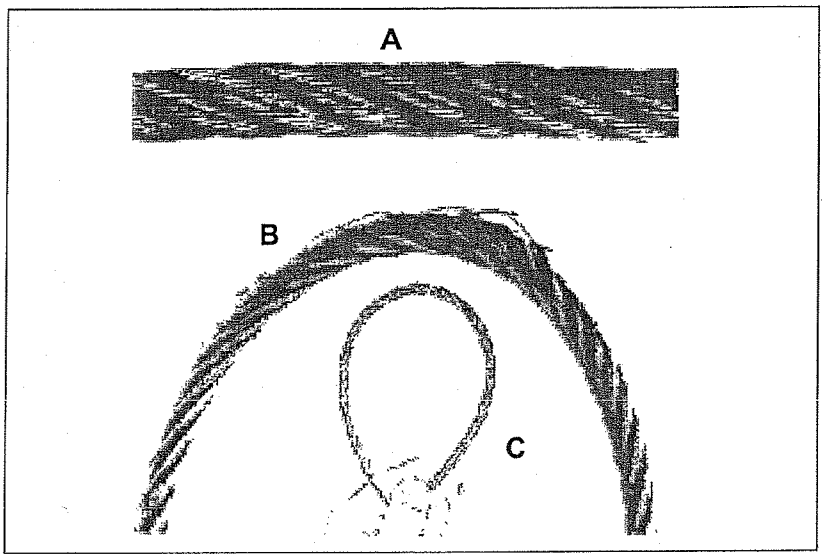


Figure 27-2 Control Cable Inspection Technique

External Wear Patterns

Wear will normally extend along cable equal to the distance cable moves at that location. Wear may occur on one side of the cable only or on its entire circumference. Replace flexible and non-flexible cables when individual wires in each strand appear to blend together (outer wires worn 40-50 percent) as depicted in Figure 27-3.

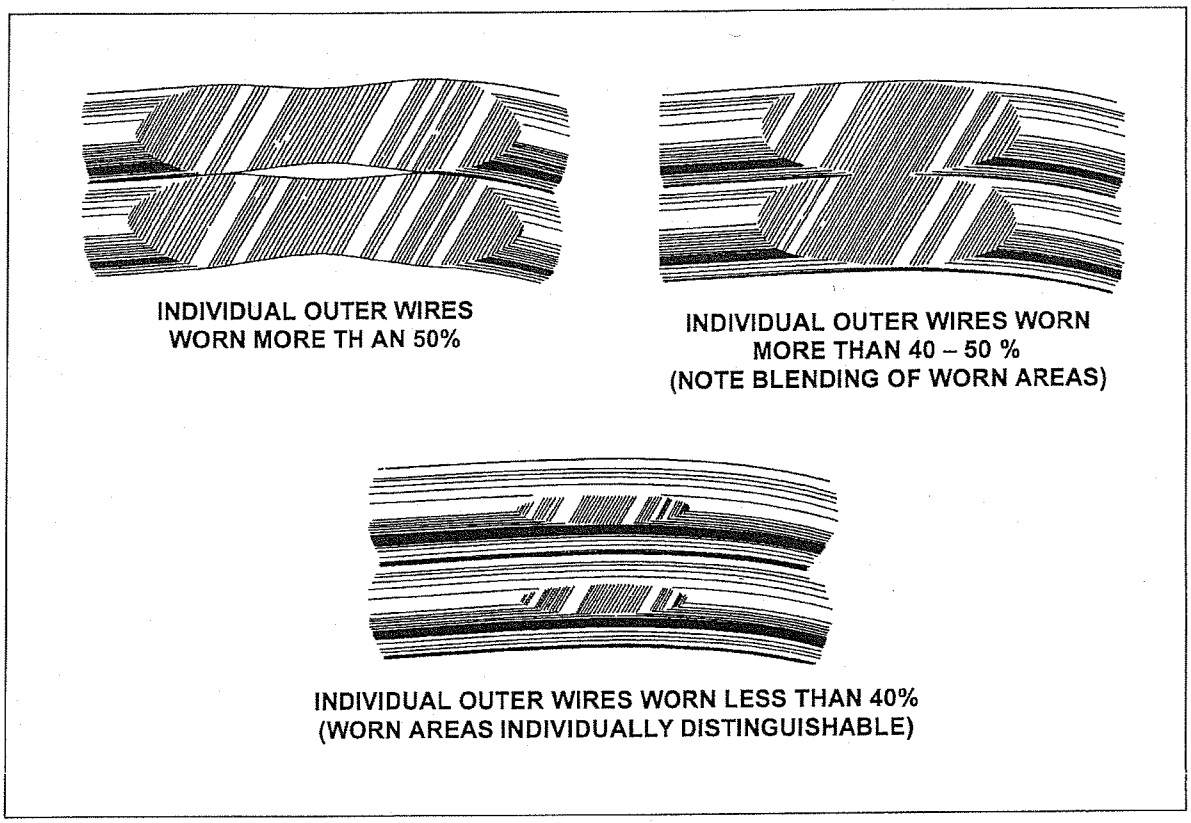


Figure 27-3 Cable Wear Patterns

Internal Cable Wear

As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition, shown in Figure 27-4, is not easily detected unless the strands of the cable are separated. Wear of this type is a result of the relative motion between inner wire surfaces. Under certain conditions the rate of this type wear can be greater than that occurring on the surface.

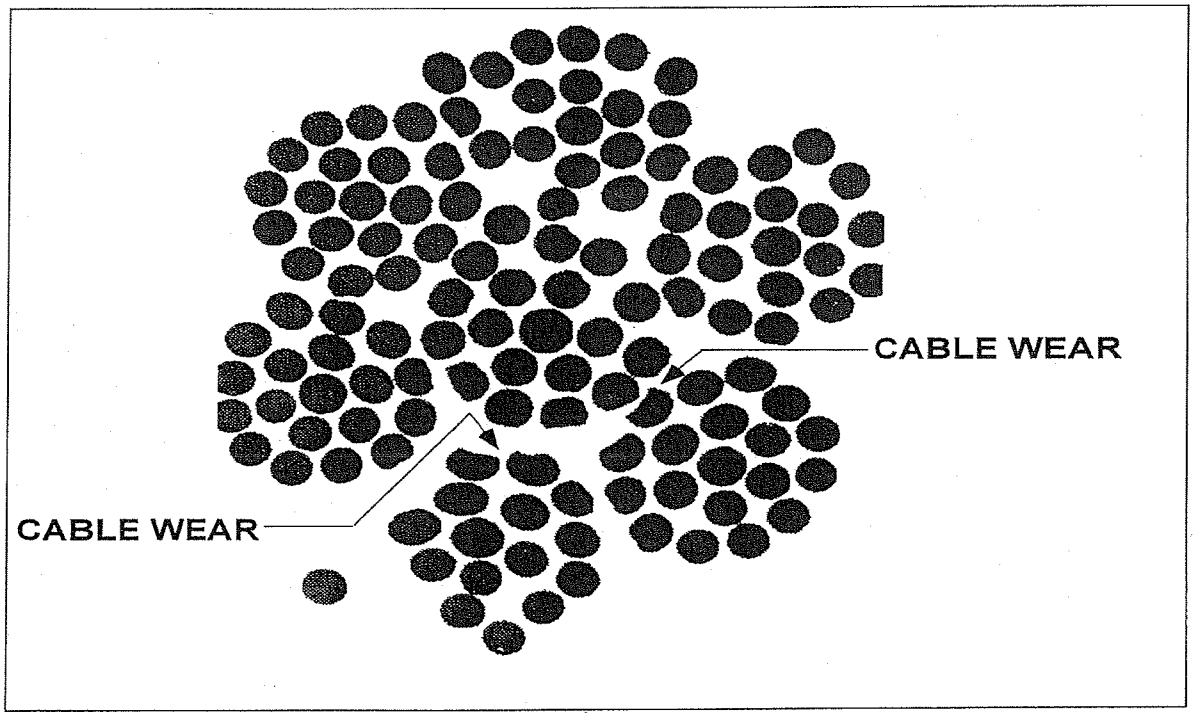


Figure 27-4 Internal Cable Wear

Corrosion

Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear producing airframe components such as pulleys, fairleads, etc. It may be necessary to remove and bend the cable to properly inspect it for internal strand corrosion as this condition is usually not evident on the outer surface of the cable. Replace cable segments if internal strand rust or corrosion is found.

Areas especially conducive to cable corrosion are battery compartments, lavatories, wheel wells, etc., where concentrations of corrosive fumes, vapors, and liquids can accumulate.

– NOTE –

Check all exposed sections of cable for corrosion after a cleaning and/or metal-brightening operation has been accomplished in that area.

Cable Maintenance

Frequent inspections and preservation measures such as rust prevention treatments for bare cable areas will help to extend cable service life. Where cables pass through fairleads, pressure seals, or over pulleys, remove accumulated heavy coatings of corrosion prevention compound. Provide corrosion protection for these cable sections by lubricating with a light coat of graphite grease or general purpose, low-temperature oil.

– CAUTION –

Avoid use of vapor degreasing, steam cleaning, methylethylke - tone (MEK) or other solvents to remove corrosion-preventative compounds, as these methods will also remove cable internal lubricant.

Cable Fittings

Check swaged terminal reference marks for an indication of cable slippage within fitting. Inspect fitting assembly for distortion and/or broken strands at the terminal. Assure that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

Pulleys

Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to assure proper lubrication, smooth rotation, freedom from flat spots, dirt, and paint spray. Periodically rotate pulleys, which turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on flanges and chafing against guards, covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

1. Pulley Wear Patterns

   Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these conditions are shown in Figure 27-5.

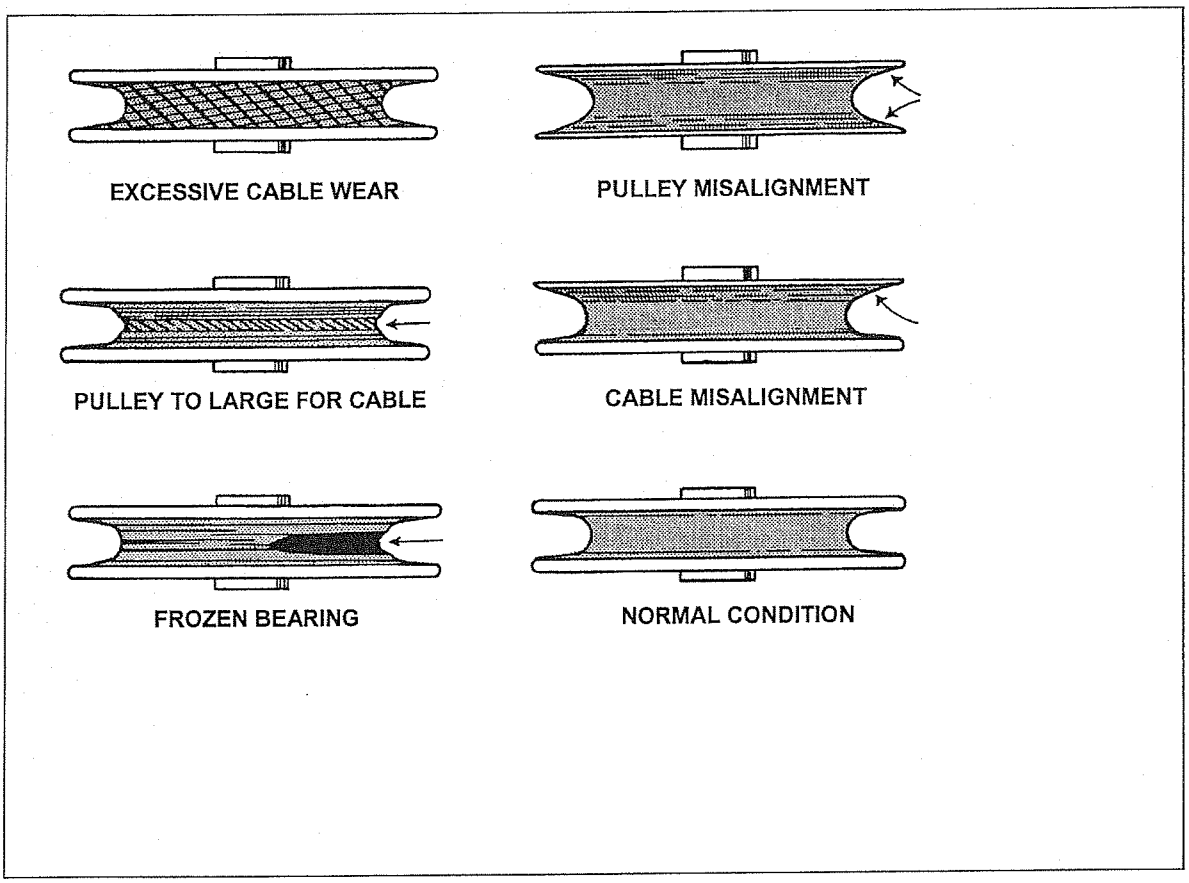


Figure 27-5 Pulley Wear Patterns