SECTION III INSTRUMENT FLIGHT

8-26. INSTRUMENT FLIGHT – GENERAL.

This aircraft is restricted to visual flight conditions. Flight into instrument meteorological conditions will be conducted on an emergency basis only. Flight handling, stability characteristics, and range are the same during instrument flight as for visual flight. Navigation and communication equipment are adequate for instrument flight.

SECTION IV FLIGHT CHARACTERISTICS

8-27. OPERATING CHARACTERISTICS.

a. The flight characteristics of this helicopter, in general are similar to other single-rotor helicopters.

b. N2 droop may occur during a normal flight maneuver requiring a rapid increase in power (i.e., rapid collective and/or tail rotor inputs, high-G maneuvers). If N2 droop occurs, but low RPM warning is not activated and N2 recovers to 100 percent within 5 seconds, and further droop is not experienced, this is considered a normal flight characteristic.

8-28. MAST BUMPING.

Mast bumping (flapping-stop contact) is the main yoke contacting the mast and may result in a fractured mast and rotor separation. It may occur during slope landings, rotor startup/coastdown, or when the flight envelope is exceeded. If bumping occurs during a slope landing, reposition the cyclic to stop the bumping, reestablish a hover, and land on less sloping ground. If bumping occurs during startup or shutdown, move cyclic to minimize or eliminate bumping. If the flight envelope is inadvertently exceeded, causing low "G" condition and right roll, move cyclic aft to return rotor to a positive thrust condition, then roll level, continuing flight if mast bumping has not occurred. As collective pitch is reduced after engine failure or loss of tail rotor thrust, cyclic must be positioned to maintain positive "G" forces during autorotation. Touchdown should be accomplished prior to excessive rotor RPM decay. After landing, an entry in DA Form 2408-13-1 is required for appropriate maintenance inspection.

8-29. SPIKE KNOCK.

a. Spike knock occurs when the round pin in the drag-pin fitting contacts the side of the square hole of the pylon stop, which is mounted to the roof. it creates a loud noise and will occur during a rocking of the pylon. The following factors can cause a spike knock: low rotor RPM, extreme asymmetric loading, poor execution of an autorotational landing and low G maneuvers below +0.5 Gs.

b. Spike knock will be more prevalent during zero ground run autorotational landings than for sliding autorotational landings and running landings.

c. Spike knock in itself is not hazardous but is an indicator of a condition that could be hazardous. if spike knock is encountered, an entry must be made on DA Form 2408-13-1, to include the flight conditions under which the spike knock has occurred. An inspection will be performed by maintenance personnel before continuing.

d. During landing, starting, and rotor coastdown, spike knock could also occur, especially if there are high winds and/or the elastomeric damper is deteriorated. This type of spike knock is not considered damaging to the aircraft.

8-30. PYLON WHIRL.

Pylon whirl is a condition which occurs after blade f apping and mast bumping. The resultant motion of the pylon is elliptical, and spike knock is apt to occur. If the frequency of motion coincides with a particular natural frequency of the helicopter, and the amplitude and direction of the force is large enough, damaging vibrations can occur in the aft section tailboom of the helicopter. Motion of this type could occur during touchdown autorotations, if operational limits are exceeded.

8-31. CRITICAL TAILBOOM DYNAMIC MODES.

Two critical tailboom dynamic modes exist. One of these may occur during an improperly executed touchdown autorotational landing, and corresponds to a frequency of less than 64 percent rotor RPM. The second may occur during a high speed autorotational entry, or any maneuver in which application of collective allows a significant decay in rotor RPM down to a critical frequency corresponding to approximately 68-73 percent RPM. At high blade angles of attack (increased collective). there may be a point where the blade does not produce more lift. When there is this condition of low rotor speeds and high collective blade angles, there will be excessive f apping of the main rotor. The cycle will be as follows: rotor blade f ap, mast bumping, and spike knock, which will ultimately results in main rotor inertia/energy transfer to the airframe. These conditions generate a resonance and the tailboom will rapidly respond to these frequencies. The tailboom will then have up and down movements as it responds to the resonant condition and at some point, a structural failure will occur. typically, there will be wrinkles in the tailboom just aft of the boom attaching points. After the tailboom has buckled and/or been damaged, the vibrations may (and usually will) crease; predominantly, because the failure unloads the condition or the landing has stopped or main rotor f apping has ceased. these could be aggravated by high winds and abrupt cyclic inputs while in the condition. High forward speed relative to the maneuver may provide the driving force for excessive blade f apping, mast bumping, and as a result, damaging vibration. Likelihood of encountering the second mode is remote and is avoidable. if operating limitations of the helicopter are observed.

8-32. LOSS OF TAIL ROTOR EFFECTIVENESS.

a. Loss of tail rotor effectiveness (LTE) is the occurrence of an uncommanded and rapid right yaw rate which does not subside of its own accord and which, if not quickly reacted to , can result in loss of aircraft control. However, the term “loss of tail rotor effectiveness” is misleading. The tail rotor on this aircraft has exhibited the capability to produce thrust during all f ight regimes. Under varying combinations of wind azimuth and velocity, tail rotor thrust variations can occur. When this occurs, the helicopter will attempt to yaw to the right. this yaw is usually correctable if immediate additional left pedal is applied. Correct and timely pilot response to an uncommanded right yaw is critical. If the response is incorrect or slow, the yaw rate may rapidly increase to a point where recovery may not be possible in the terrain f ight regime.

NOTE

The pilot must anticipate these variations, concentrate on f ying the aircraft, and not allow a yaw rate to build.

b. Extensive f ight testing and wind-tunnel tests have identif ed three relative wind azimuth and velocity regions as capable of adversely affecting aircraft controllability and dramatically increasing pilot workload. For illustration, specif c wind azimuths and velocities are identif ed for each region (see f gure 8-2). However, the pilot must realize the boundaries of these regions may shift in azimuth or velocity depending on the ambient conditions.

(1) Weathercock stability (120-140 degrees). Winds within this region will attempt to weathervane the aircraft into the relative wind. The helicopter exhibits a tendency to make a slow uncommanded yaw to either the left or right, depending upon the exact wind direction. Due to the inherent yaw characteristics of this helicopter, the right yaw rate will increase unless arrested by the pilot. A right yaw can develop into an LTE condition and requires immediate correction.

(2) Vortex ring state (210-330 degrees). Winds within this region will cause a vortex rind state to develop around the tail rotor, which, in turn, causes tail rotor thrust variations. The helicopter exhibits a tendency to make uncommanded pitch, roll, and yaw excursions. The subsequent aircraft reactions require multiple pedal, cyclic, and collective inputs by the pilot. maintaining a precise heading in this region will be impossible. Pilot workload in this region will be high; therefore, the pilot must concentrate fully on f ying the aircraft and not allow a right yaw rate to build.