

**GENERAL NOTES:**

- The following instructions assume that the original manual retraction system is installed in the airplane and is being replaced by the new electric system.
- Part designations are for the COZY or LongEZ. They also apply to the COZY MKIV but the MK designation has been omitted for brevity.
- Installation drawings and wiring diagrams are provided and reference in these instructions.
- The installation of the system requires no structural modifications for the LongEZ, COZY, COZY MKIV or the Berkut.
- This unit has been installed in the VARIEZE. The installation requires removal of a small part of F22 bulkhead to allow the corner of the gearbox to extend through it approx. 1”.

**WARNINGS**

**1. When testing the retraction system on the bench or for checking the microswitch settings, the lower extension tube should be prevented from rotating.**

When the unit is not installed only friction between the lower and upper housing to keep the housing from turning. Unrestrained, the lower tube will turn with full torque when the mechanical limit is reached thereby damaging the micro switches.

**2. The actuator should never be operated from an unlimited current source (ie, battery) without a 10 amp circuit breaker in the power lead and the micro switches operational.**

The unit is equipped with an internal slip clutch that prevents damage when the unit reaches its mechanical limits, however the action of the clutch is violent and uncalibrated. If this is allowed to occur repeatedly, it may result in damage to the nylon gears or the mechanical stops. Damage of this nature to the down stop can cause failure and result in further damage to the internal ball screw components. If during normal use, a micro switch fails to stop the travel for any reason the unit should not be operated until the switch is repaired. If the unit appears to bind or makes unusual noises after a micro switch failure has occurred, it should be checked before further use.

**REMOVAL OF STRUT**

- \_\_\_ 1. Raise the nose of the airplane to a comfortable working level that is still stable and support it with a support under the front rubber bumper.
- \_\_\_ 2. Weight the nose of the airplane with 20+ lbs. of ballast to offset the loss of weight while removing the existing gear system.
- \_\_\_ 3. Extend the gear and remove the pivot bolt in NG3.
- \_\_\_ 4. Remove the pivot bolt in the NG6 and completely remove the nose gear assembly.

**Note 1:** The hardest part on a LongEZ is removing the strut pivot bolt. This has to be done in any either case. Sometimes the bolt is bent or worn from landing with loose bearings. This makes it hard to get out. Also the ability to get at it and drive it out is limited. Most people drill a hole in the fuselage side in line with the bolt and drive it out if they have trouble. (In severe cases the bolt is frozen by corrosion in the NG7 spacer. This requires inserting a Sawsall or Saber saw with a metal cutting blade between the old casting and the NG30 and cutting the bolt.) The hole can be repaired easily with flox or micro. Don't forget to weight the nose before you remove the strut. The nose wheel and strut weigh at least twenty pounds.

**Note 2:** In some cases the strut can not be removed from the plane due to the tightness of NG-6. If this is the case remove the bolt from NG-6, reinstall the bolt in NG3 extend the strut about one half way down and lower the nose of the plane on to the strut. The weight of the plane will force the strut out. The strut will want to move forward at the NG-6 point.

**MAKE SURE** you put some scrap wood/foam on the front of NG-6 to help prevent damage to the fiberglass.

**Note 3:** If you are not installing the optional Custom Product Design NG6A now is the time to consider it. The stress placed on NG6 is very high during extension/retraction when the plane is fully loaded. This stress will increase the deformation of the original NG6 bronze bushings causing strut side play. Our custom designed NG6A with preloaded tapered roller bearings will permanently eliminate all strut side play and reduce the overall stress on your new actuator system.

**REMOVING THE STRUT HARDWARE**

- \_\_\_ 1. Remove NG3, NG4
- \_\_\_ 2. Remove the bolts in NG15. Pry off NG2 from NG1 strut. NG4 will be reused.
- \_\_\_ 3. If the flox bed holding NG15 to the strut is loose after removal of NG2 remove NG15.

**ATTACHING THE SUPPORT FOOT (NG2 REPLACEMENT)**

- \_\_\_ 1. Reattach NG15 and the new NG2A support foot to the strut using a flox bed. The new foot is made of stainless steel and is shipped with out the bolt holes drilled (to allow for variations in your plane).
  - When installing this foot, be sure that the nose wheel can caster full 360 degrees before final positioning of the NG15 and support foot.
  - Use new AN3 or AN4 (MKIV) bolts.
  - It is recommended that an AN3 bolt be installed through the sides of the NG15 and through the strut to insure that the NG15 is held in place if the flox bond breaks loose. Refer to the drawings supplied for proper orientation.
  - Make sure the wheel is straight with the strut and is at the proper angle with the face of the strut. Shim the casting with relation to the strut and fill in with flox, if necessary, to get the proper angle. If this angle is not correct the nose wheel may have shimmy problems when the gear is adjusted for maximum nose up ground angle.

**INSTALLING THE NG3A**

You will now install the new heavier NG3A (made of stainless steel). Please pay special attention to this step. **These dimensions are critical because the length of the nose gear multiplies a very small error.**

- \_\_\_ 1. Place NG3A on the strut. ).
  - Refer to the drawings for the proper dimensions to locate the part.
- \_\_\_ 2. Align the holes in the NG4 with the ¼” holes in the NG3A as concentric as possible. It may be necessary to remove some strut material or add flox to make the parts fit the strut with the holes concentric.

**Note:** Do not drill the #10 hole (in NG3A) through the strut at this time. The position of NG3A can be moved slightly if needed to adjust the retracted position if this bolt is not installed.
- \_\_\_ 3. Flox NG3A and NG4 in place, install the AN3-16A and AN4-16A bolts to hold them in place until the flox cures.

**REMOVAL OF MANUAL EXTENSION SYSTEM**

- \_\_\_ 1. Remove the manual extension mechanism completely.
  - The long AN4 bolts and spacers will be reused.
- \_\_\_ 2. Disconnect the existing warning microswitch from the mechanism if it is used leaving the wires installed. The wires may be connected together to allow the existing system to work as a canopy warning system only. The new system provides warning indicators on the panel.

## INSTALLATION OF ACTUATOR MOUNTING PLATES

The new electric lift is shipped with the microswitches adjusted for 1/8"-1/4" of mechanical travel left on both ends. The unit is shipped in the retracted position. Be sure that the over travel is at least .2" before beginning the installation. The reason for this is allow some adjustment for fully retracting the gear after installation. This can be checked by verifying that after the micro switch stops the actuator travel, one full turn of the actuator shaft is possible before the mechanical stop is reached.

**Note:** The mounting plates use the three upper mounting holes used for the manual system. One of these holes on the left side may be drilled but may not have a hard point reinforcement because it was not used in the manual installation. It is recommended that a hard point reinforcement be added if it is not present. This can be done by removing the glass and foam on the outside of the NG30 for a 1 inch dia. around the hole and filling the cavity with flox (Epoxy mixed with cotton fibers). The hole can then be redrilled.

- \_\_\_ 1. The mounting plates only have one hole, of the three needed, drilled (to allow for variations in your plane). The one that is drilled is the far forward hole and mounts in the second hole back in the NG30. This allows the plates to be installed (held in place) and the unit put in place prior to drilling the other two holes.
- \_\_\_ 2. The nose gear assembly is then installed and held up in the fully retracted position. Make sure the nose gear is held up tight. Placing a support under the face of the nose gear strut and allowing the weight of the airplane to rest on it can do this.
- \_\_\_ 3. The actuator gearbox is then braced away from the front face of F22 with a one inch spacer. (A 2" spacer should be used on the MKIV). This establishes the actuator proper angle for installation in the individual airplane.
- \_\_\_ 4. The other two holes in each mounting plate are marked by inserting a .25" drill in the existing holes and rotating it enough to establish the hole center.
- \_\_\_ 5. The actuator and mounting plates is then removed from the plane and the hole positions in the mounting plate checked to make sure they have adequate edge distance.
  - If they do not the spacer should be adjusted slightly and the holes remarked until the edge distance is not less than 3/8" center to edge.
- \_\_\_ 6. The holes can then be drilled and the mounting plates permanently installed using the bolts and spacers from the original manual extension system.
  - Make sure the hole positions match the holes in the NG30 exactly before final drilling and are perpendicular to the mounting plate. If they are not the bolts will be impossible to get in.

**INSTALLATION OF MANUAL EXTENSION ROD**

You will now installation the manual actuator rod. The manual extension shaft projects out of the top of the gearbox. A Mil Spec universal joint attaches to the manual extension rod to the manual extension shaft with set screws.

Pay special attention to the angle of the long actuator rod in relation to the small shaft extending from the gearbox. You should attempt to keep the angle at 20 degrees or less when choosing an exit point of the rod on the instrument panel face.

The optimum position (least amount of turning angle) for the actuator rod is to exit the instrument panel is at a point near the top or a point much higher than originally called for by the plans. It has the advantage of being in the line of sight and is much easier to turn in an emergency. This position also minimizes the stresses on the universal joint. The drawback is a possible instrument interference.

**Note 1:** If the position you have chosen on your panel causes the u-joint angle to be more than 20 degrees a second universal joint and a bracket to hold the first joint at 20 degrees should be installed. Contact us for a bracket and an additional universal joint.

**Note 2:** The manual extension rod is shipped longer than required so that individual builder manual extension exit positions can be accommodated.

- \_\_\_ 1. A 5/8" wide by approximately 1" long slot must be milled in f22 to allow clearance for the manual extension shaft and universal joint.
  - A 5/8" dia wood dowel 3" long with a 1/4" dia. hole drilled at it's center can be used as a drill guide for the long 1/4" dia drill all builders have or a 1/4" dia. Sharpened rod can be used.
- \_\_\_ 2. Put the dowel through the actuator pivot pin holes and center it. Hold it centered by putting a C clamp over the outside of the mounting plate mount pin holes. With the drill in an electric drill. Put the drill through the hole in the dowel.
  - Refer to the procedure and the installation drawing titled: **RETRACT – INSTALLATION (LONGEZE & COZY) or (COZY MKIV).**
- \_\_\_ 3. Pick a place on the upper panel that has a straight line shot to the slotted hole in F22.
- \_\_\_ 4. Drill the panel to fit the outside dia. of the extension shaft.
- \_\_\_ 5. Allow the 1/4" drive extension rod socket to stick out of the panel 2". Try a 1/4" drive ratchet in the extension socket and make sure you can turn it a lease 180 degrees without obstruction.
- \_\_\_ 6. Install the actuator temporarily by using the pivot mount pins, pivot pin bolts, and the NG3A bolt. The pivot pin clamp washers need not be installed for this temporary installation.
- \_\_\_ 7. Thread the manual extension tube with the u-joint installed on it through the F22 slot as you bring the actuator into place from the front side of F22.
- \_\_\_ 8. Engage the u-joint hex with the actuator manual drive shaft hex shaft as you bring the actuator into place.

- \_\_\_ 9. Check the u-joint clearance in the slotted f22 hole with the actuator retracted and extended. Enlarge if necessary.
  - Shorten the manual extension tube if needed. Remove the shaft and U-joint and match drill the shaft for the drive pin.
  - Install the manual extension tube in the u-joint using an AN3 bolt as shear pin.

## WIRING THE SYSTEM

- \_\_\_ 1. Install the retraction switch control panel in the instrument panel where it is accessible by the pilot.
- \_\_\_ 2. The mounting and wire routing is left up to the individual builder. The harness provided assumes that the power sources will be at the instrument panel.
- \_\_\_ 3. If you purchased the nose lift with the automatic extension wiring and control panel, (optional at no added cost), the wiring harness supplied with the Actuator unit is setup to allow mounting of the AEX module on the outside of NG30 near the actuator. Isolated power wires for the AEX unit are provided. They should be connected to the main bus and ground separately from the connections for the main 10 amp actuator power. Refer to the wiring diagram provided for details.
  - It is recommended that the actuator have it's own 10 amp circuit breaker that is not turned off with master switch. This allows the gear to be manipulated for entry and exit as well as parking, moving, etc without turning the master switch off and on.
  - Also if the automatic extension circuit is added later it is wired through the master switch making it active only when the aircraft is made ready for flight.
  - The 10 amp breaker is barely enough for the actuator normal loaded current drain. It adds a safety factor in case of misadjusted micro switches or obstructions such as nose wheel not straight during retraction.

## WARNING

**The actuator is capable of 3000 lbs. of straight line lifting force that will cause damage and injury even when protected by the slip clutch and the circuit breaker. In case of micro switch failure or misadjustment, the over travel in the up position is about .15" at the actuator. The internal rubber shock cushion will absorb this and the actuator will reach its mechanical limit and pop the breaker. This feature will protect the aircraft structure from damage.**

**FINAL MICROSWITCH ADJUSTMENTS**

- \_\_\_ 1. Small screws holding the micro switch and sliding the micro switch in the slots. The up micro switch can be adjusted to fully retract the gear by loosening the provided.
  - Be very careful that it is not adjusted too high. Even though the actuator has a internal rubber shock pad that will allow a small amount of over travel, the actuator can easily pull off fairings, gear doors etc.
- \_\_\_ 2. The down micro switch is not critical except to make sure the aircraft has a positive ground angle of 1 ½ to 2 degrees up angle as measure on the longerons for minimum ground run on takeoff and to keep the NG15A shaft from having a forward angle.

**FINAL INSTALLATION OF ACTUATOR**

- \_\_\_ 1. After the actuator microswitch adjustments is complete the actuator can be permanently installed. The pivot pins should be removed one at a time and the clamp washers (special curved washer that is held against the upper housing by the pivot pin shoulder) installed between the pin and the upper housing. Make sure the split lock washers are installed between the bolt head and the large flat washer.
- \_\_\_ 2. The pivot pin bolts should be tightened to 100 in lbs.
- \_\_\_ 3. After tightening check the clamp washers. They should be tight against the upper housing. If they are not the pins are bottoming and should be shortened slightly.
- \_\_\_ 4. The NG3A nut should be tightened.
- \_\_\_ 5. The pivot pin bolt length is critical.
  - If they are replaced they must be replaced with bolts of the same length. Longer bolts will lock up the actuator.
  - After several full load lifts the bolt torque should be rechecked. The bolt torque and pivot pin clamp washer tightness should be checked periodically, especially if the actuator is routinely used to lift the aircraft from the ground with a full front seat load on Cozy type aircraft.
  - Install the bolt through NG3A and the strut. Use the hole in NG3AA as guide to drill through the strut. Drill from one side half way and then drill from the other side until the holes meet. Use a drill press or a drill guide to get the holes as straight as possible or the holes may not meet. Drill the assembly out using a #10 drill.

## AUTOMATIC EXTENSION UNIT

The automatic extension unit is designed to eliminate gear up landings. This electronic system is integrated into the wiring of the retraction system and unlike the simple air pressure/relay type, this system is an analog computer with a built in logic design.



You can purchase the retraction system pre-wired for the future installation of the AEX module at no additional cost. This will allow easy upgrading of your system with the absolute minimum of effort. Just plug in the AEX module into your system for full automatic operation and increased safety.

## PRE-INSTALLATION:

If you purchased the nose lift with the automatic extension wiring and control panel, (**a no added cost option**), the wiring harness supplied with the Actuator unit is designed to allow easy mounting of the AEX module on the outside of NG30 near the actuator at anytime.

The wiring harness is provided with a bus plug in the P2 connector that allows the unit to be used normally without the AEX installed.

During normal wiring installation of the retraction unit you should:

- The isolated power wires for the AEX unit should be connected to the main bus and ground separately from the connections for the main 10 amp actuator power.
- The main gear electrical supply (10 amp breaker) is shown on the wiring diagram connected ahead of the master switch. The automatic extension system is shown connected through a small breaker from the master switch main bus.

You are now ready for the future installation of the AEX unit!

## INSTALLING THE AEX UNIT:

- The P2 bus plug is removed and the AEX unit plugged in.
- The hookup to the pitot system can be accomplished by using a T in the line from the pitot tube to the airspeed indicator and connecting it to the pressure side of the automatic system sensor. The other side of the sensor can be connected to the static system but it is not required for operation.



## OPERATION

The unit controls the gear extension when the manual switch is in the **UP** or **OFF** position by sensing the airspeed and extending the gear when the airspeed is reduced to the set airspeed (factory set at 90 Knots).

- **On Take off:** The system is activated by an airspeed of greater than 90 knot airspeed. This starts the automatically 20 second delay before the gear retracts.

You can immediately retract the gear after your airspeed is greater than 90 knots if you push the defeat switch.

- **On Landing:** The system is activated by airspeed of less than 90 knots. The reduced airspeed causes the gear to immediately and fully extend.

The gear will stay extended for 20 seconds even though the airspeed may increased above the 90 knot airspeed set point.

The automatic operation can be defeated by pressing the panel mounted defeat switch which disables the automatic feature for 20 seconds after it is momentarily pushed. You can then immediately retract the gear. After the 20 sec delay the system reverts back to fully automatic operation.

Properly wired the gear will always extend when the airplane is on the ground and the master switch is on. When the master switch is **OFF** the gear can be manually retracted for parking, moving etc. This hookup automatically checks the automatic circuit for proper operation.

- If the airplane is boarded with the gear in a retracted or partially retracted position with the manual switch in the **OFF** or **UP** position and the master switch is turned on the gear should automatically extend.
- If it does not the automatic system is not working properly.

You are now ready to start using your new lift system.

## NOTES

Although the system can easily lift a full loaded plane with passengers and pilot, the stresses placed on the airplane are extremely high for the first 12 inches of lift (as measured from the ground to the bottom of the nose).

After the nose is raised beyond the 12 inch point, the stresses quickly decrease (very similarly but much higher to when you manually lifted the plane prior to installing the actuator).

As an operational consideration:

- You can load the plane (without the front seat occupants), raising the plane to about 12 inches off the ground and then load the front seats.
- You can load the copilot raise the nose 12 inches and then load the pilot.

**Either way this will reduce the initial stress on the plane and extend the life of the plane and actuating system.**