

ANNUAL INSPECTION LIST

How to use this manual

1. Items should be followed in the order of print.
2. The time interval of each inspection is annually or every 100 hours.
Note: Anytime a part or component is removed for any reason it must be inspected prior to returning it to service.
3. General inspection criteria is printed in the back of this document and should be referred to when noted or when criteria is not noted in the inspection checklist.
4. The AC-43.13 A/3 provides important information concerning inspection and repairs, it will be referred to in this document.
5. Use the Titan Tornado assembly manual for parts reference and reassembly.
6. Components, subassemblies, or parts not listed in this document should use the appropriate manufacturers manual or the AC-43.13-1A/3 for inspection, maintenance, and repair.
7. This manual should be read in its entirety to prevent excluding or unnecessary repeating inspections or maintenance.

Note: All maintenance inspections and tolerances are preliminary.

Fuselage

Frame: (include all components welded to the frame)

1. Visually inspect:
 - For corrosion
 - Tubes and attached components for bends, cracks, or distortion
 - **Note:** Warped belly skins, windows, or sags in the fabric are all possible signs of frame damage and must be investigated completely to determine the extent and severity of the damage
 - Welds for cracks
 - **Note:** Pay close attention to the wing fittings and engine mount tubes for cracks or other damage

Belly Skins:

1. Visually inspect:
 - For missing, loose, or fretting rivets
 - For cracks or dents
 - For signs of buckling or distortion
Note: This type of damage may be the result of further damage and should be investigated to determine the extent and severity of the damage
 - For corrosion
 - For scratches and nicks



Nose Fork:

1. Visually inspect:
 - Nose fork rods for cracks, splinters, or bends
 - Rod attachment points for signs of disbanding
 - Weldments for cracks
 - For corrosion
 - For wear in areas of the cup and nylon bushing, reject if wear exceeds .025" in depth for 30% of circumference
 - For cracks or other damage to the nose fork assembly
2. Lubricate the nose fork retainer cup with nickel anti-seize and the nylon bushings with lithium grease or a high quality multi-purpose grease only as needed.

Landing Gear and Spindle Assembly:

1. Visually inspect:
 - Fiberglass legs for cracks or splinters
 - Weldments for cracks
 - Axle for signs of bending
 - **Note:** This may be done by viewing through the axle
 - Retainer hardware and collar for security and torque

Wheel Assemblies:

1. Visually inspect:
 - Tires for cuts, nicks, or dry rotting
 - **Note:** Damage to the tires that cause bulging, distortion, exposed cords, or leaks must be replaced
 - Tires for excessive wear; replace tire if tread is worn off for more than 10% of the circumference or if any cords are exposed
 - Wheel rims for cracks; replace cracked rims
 - Wheel rim bolts for proper torque
 - Inner tube for signs of dry rotting, weak or thin areas; holes and cuts may be repaired per local acceptable patch methods; dry rotting, weak or thin areas will require inner tube replacement
2. Replace wheel bearings that are damaged, corroded, or do not rotate smoothly.

Brakes:

1. Lubricate cam and cam pivot point only as required. **Note:** Do not get any lubricant on brake pads or drum.
2. Visually Inspect:
 - Brake back plates for proper hardware torque and cracks; replace if cracked
 - Security of cable swivel
 - Cam and activating arm for sticking or binding



- Brake drum for warpage or cracks
- Replace pads if:
 - a. Pads are worn down to .030” for more than 50% of the wear area
 - b. Pads are worn down to .010” for more than 10% of the wear area
 - c. Pads become disbanded
- For corrosion

Forward and Aft Rudder Pedals:

1. Visually inspect:
 - Rudder and brake pedals for cracks or bends
 - Bolts for proper torque or signs of elongated holes
 - Cable tangs for elongated holes; replace if damaged
 - Axles and pedal pivot points for wear

Note: Wear exceeding 10% of original tube wall thickness should be replaced.
 - For corrosion
2. Lubricate wear points only as required.

Control Stick, Stabilator Push/Pull Tube, and Aileron Push/Pull Tube Assemblies

1. Visually Inspect:
 - All hardware, ball joints, and nylon bushings in accordance with the inspection criteria set forth in the back of this document
 - All weldments for cracks
 - For corrosion
 - For freedom of movement in the control stick to the maximum control surface deflections without restriction or binding
 - Stabilator push/pull tube assembly for evidence of chaffing with the lower rudder bushing, the landing gear truss, the tail boom, or the main nylon control guide
 - Aileron and stabilator push/pull tubes and the control stick for dents or bent tubes
 - Bolt holes for elongation; replace damaged parts
 - Torque tube retainer, forward and after control stick mounts for looseness or loose or fretting rivets

Note: If these rivets are loose, the part may also be bonded along with replacing the rivets to prevent further damage
2. Lubricate pivot points and bushings as required.



Adjustable Rudder Pedal Assembly

1. Visually inspect:
 - All weldments for cracks
 - For corrosion
 - For ease of movement without binding or interference

Note: Check movement in both the forward and after pedal adjustments

 - Hardware, ball joints, and any nylon bushings in accordance with inspection criteria set forth in the back of this document
 - For ease of pedal adjuster movement

Tail boom Assembly

1. Visually inspect:
 - Tail boom for any sign of kinks.

Note: Pay close attention to point of fuselage attachment of the lower side of the boom; kinks are caused by abnormal stress conditions and no repair is permitted only tail boom replacement; any signs of kinks should be followed by a complete fuselage frame inspection for possible further damage

 - For corrosion
 - For dents, scratches, or nicks

Vertical and Strake

1. Visually inspect:
 - For missing, looses or fretting rivets
 - For corrosion
 - For dents, scratches, or nicks
 - Vertical and strake for buckling or distortion; replace damaged parts.

Note: Further airframe examination should be done to determine the cause and extent of the damage

 - Attachment and condition of upper rudder hinge
2. Lubricate upper rudder hinge as required.

Rudder

1. Visually inspect:
 - For evidence of internal damage; i.e...bent trailing edge, sages in or loose fabric, or binding rudder action
 - Upper hinge for loose rivets, insecure attaching hardware, or worn bushing; .030" maximum radial play
 - Lower rudder bushing for cracks in boom tube weldment and excessive wear; radial limit .030" axial limit .050"



- Rudder driver for worn or elongated attachment point and proper torque of attachment bolt
 - Note:** Side to side rudder play with controls locked and proper cable tension measured at the bottom of the rudder trailing edge should not exceed 1/2"
- For cracks
- Pay particular attention to weldments
- For corrosion
- Rudder driver for elongated holes at cable attachment points

2. Lubricate wear points as required.

Stabilator

1. Visually inspect:
 - For evidence of internal damage; i.e...look for bent trailing edge, looseness or sags in the fabric.
 - For dents, scratches, or nicks in aluminum skin
 - For missing, loose, or fretting rivets
 - For free and smooth travel to both stops
 - For proper balance
 - For delamination of leading edge skins; inspect this by applying a light pressure with your hand on the suspected area and feel for a void between skin and foam
 - Stabilator spar (where practical) for signs of cracks, dents, or distortion; no damage permitted
 - Stabilator for control horn for cracks; no cracks permitted or wear, maximum radial play of control attachment point .010"
 - Attaching eye bolts radial play in stabilator spar .005" max and radial play in eye bolt hinge point .003" max

Anti-Servo Tab and Assembly

1. Visually inspect:
 - For loose or fretting rivets
 - For cracks; no cracks allowed
 - For dents; no dents allowed
 - Twisting or warping; no twisting or warping allowed

Note: Any damage to the anti-servo tab may cause flutter and therefore no repair is permitted - only replacement
2. Visually inspect the anti-servo swing arm for:
 - Security of attachment points
 - Smooth operation in full deflection



- Cracks; no cracks allowed
 - Max radial play at pivot points .010"
3. Visually inspect anti-servo control rod for:
 - Cracks and bends
 - Secure attachment
 4. Visually inspect trim torque tube for:
 - Smooth operation
 - Wear at bushings .010" max wear
 - Security of attachment points and trim wheels

Stabilator Mount Ring

1. Visually inspect for:
 - Loose or fretting rivets
 - Any signs of deformation
 - Corrosion
 - Cracks; no cracks allowed
 - Wear at hinge points max radial play .003"

Tailwheel Assembly

1. Inspect visually for:
 - Loose or fretting rivets
 - Broken or damaged tailwheel
 - Cracks or deformation of tailwheel bracket

Flap Detent

1. Manual flaps only – visually inspect for:
 - Loose or fretting rivets
 - Cracks
 - Smooth operation while loaded

Instrument Panel and Hood

1. Inspect for:
 - Security, cracks, or dents



Nose Cone

1. Visually inspect for:
 - Cracks; no cracks allowed
 - Security
 - Loose or missing rivets and screws

Fuel Tank Assembly

1. Visually inspect fuel tank for:
 - Loose or fretting mounting rivets
 - Security of straps; no frays or cuts
 - Security of hold down bar
 - General security of the tank
 - Security of fuel lines, vents, cap, drains, and fuel gauge sender
 - Leaks; no leaks allowed

Throttle and Choke

1. Visually inspect for:
 - Smooth operation through full range of motion
 - Security of handles
 - Inspect cables per AC43.13-1A/3
 - Security of cables and cable swivels

Windows

1. Visually inspect all windows for:
 - Loose or fretting rivets
 - Scratches, discoloration, grazing, or anything that might impair pilot vision
 - General security
2. Clean windows.

Doors

1. Visually inspect doors for:
 - Cracked or broken tubes
 - Security of door in closed position
 - Loose or fretting rivets
 - Tears or cracks in the hinge material; replacement splices are acceptable
 - Smooth operation of door latch mechanism



Wing to Fuselage Gap Seal

1. Visually inspect for:
 - Tears, holes, or dry rotting; replace damaged parts

Seats, Covers and Back Panel

1. Visually inspect for:
 - Cracks or bent tube in rear seat
 - Cracks or deterioration of front seat
 - Tears, holes, or insecurity of front and rear seat covers and back panel

Shoulder and Lap Belts

1. Visually inspect for:
 - Tears or fraying; replace damaged parts
 - Security of latch mechanism; replace damaged parts
 - Security of attachment points

Wing

D-Cell

1. Visually inspect for:
 - Loose or fretting rivets
 - Delamination of leading edge foam rib and D-Cell skin; inspect this by applying a light pressure with your hand on the suspected area and feel for a void between skin and foam; repair per D-Cell Repair section if necessary
 - Dents and scratches

Wing Tips

1. Visually inspect wing tips for:
 - Loose or fretting attaching rivets
 - Cracks or deterioration of the fiberglass
 - General security of the wing tip
 - Deformation or buckling

Note: This type of damage will require further investigations of the wing to determine the cause

Flaps and Ailerons

1. Visually inspect for:
 - Loose or fretting rivets
 - Buckling of the aluminum skin

Note: This type of damage usually results in further internal damage and must be investigated to determine the extent of the damage – Internal damage will require complete component replacement



- Dents or cracks
- Worn or loose hinges
- Security of control horn, attachment rivets and control linkage and hardware

Flap and Aileron Torque Tubes and Push/Pull Tubes

1. Visually inspect for:
 - Loose or fretting rivets on driver and support stands
 - Freedom and ease of movement without binding or excessive friction
 - Distortion, bends, or cracks in the aileron stands and ribs used to support the flap torque tube
 - Cracks, bends, or broken aileron and flap drivers
 - Wear in the flap torque tube; this may be seen by gently pushing the bushing to expose the wearing surface; max wear .015
 - Wear in the nylon bushings
 - Worn ball joints
 - Bent or damaged torque tubes or push pull tubes; no damage allowed

Electric and Manual Flap Controls

1. Visually inspect for:
 - Security of electric flap bracket to spar and flap motor
 - All ball joints
 - Attaching hardware
 - Electric flap motor operation
 - Manual flap pivot bracket for cracks and attaching rivets for security and distortion in wing skin in this area
 - Push/Pull tube flap handle assembly for cracks or bends and general security

Wing Fittings

1. Visually inspect for:
 - Wear and proper torque of main wing fitting bolts; no wear allowed
 - Cracks in wing fittings; no cracks allowed
 - Scratches or nicks in wing fittings no deeper than .001"; scratches must be blended out with 320 grit fine sand paper only; no more than one repair per wing fitting; consult factory for main wing fitting damage
 - Wing fitting attachment to wing for looseness or fretting rivets and hardware
 - Cracks or distortion in intermediate spar especially at wing fitting attachment point

Main Wing Body to Include Spars, Ribs, Stringers, and Skins

1. Visually inspect for:
 - Scratches and dents in wing skins and aft spar
 - Buckles or distortion in wing skins



Note: This type of damage usually results in further internal damage and must be investigated to determine the complete extent and severity of the damage before repairing and returning to service

- Loose or fretting rivets

General Maintenance / Inspection Criteria

This section is designed to cover information that is not clarified in the detailed inspection list and is used in conjunction with AC43.13-1A/3 or specific manufacturer's documents.

1. Window cleaning – Presoak first with lukewarm water. Mix lukewarm water with a mild soap or detergent and wash gently using a soft sponge. **Do not scrub** or use brushes or squeegees. Rinse again. Dry with soft cloth or moist cellulose sponge to prevent water spotting. To remove wet paint, glazing compound, or grease, rub lightly with a good grade of VM7P naphtha or isopropyl alcohol, then wash and rinse. **Do not use gasoline.**
 - a. Compatible cleaning agents – Aqueous solutions of soaps and detergents, i.e...Fantastik, Formula 409, Hexcel, F.O.544, Joy, Lysol, Mr. Clean, Neleco-Placer, Pine Sol, Top Job, and Windex
 - b. Organic solvents – Aliphatic hydrocarbons, kerosene, naphtha (VM&P grade), petroleum spirits
 - c. Alcohols – Isopropyl alcohol and methanol
 - d. Graffiti removal –Butyl cello solve (for removal of paints, marking pen inks, lipstick, etc.)
 - e. To minimize scratches and minor abrasions, use a mild automobile polish such as Johnson's Paste Wax, Novus Plastic Polish #1 and #2, or Mirror Glaze Plastic Polish
2. Corrosion – All components should be inspected for corrosion in accordance with AC43.13-1A/3 Chapter 6. Any corrosion that jeopardizes the strength and integrity of that part or assembly must be repaired or replaced before return to service.
3. Fabric – All fabric should be inspected, tested, repaired, or replaced in accordance with the poly-fiber covering and painting manual and the AC43.13-1A/3 Chapter 3.
4. Cables and cable related components should be inspected, repaired, or replaced in accordance with the aircraft assembly manual and the AC43.13-1A/3 Chapter 4. Cable turn buckles must be safety wired per Chapter 4 AC43.13-1A/3. Cable tension is measured with a cable tension meter and should be 25 lbs. +/- 2 lbs. for all cables.
5. All missing, loose, or fretting rivets should be replaced accordingly to original specification listed in the appropriate section of the aircraft assembly manual, unless otherwise approved by the Titan factory.



6. Nylon Bushings – Maximum radial /axial play. **Note:** These wear limits do not include radial play caused by the wear of the component riding in the bushing, only the wear of the nylon bushing. Replace worn bushings.
 - a. Nose fork nylon bushing TC92-109:
 - 1) Radial – .030”
 - 2) Axial – .060”
 - b. Control stick torque tube bushings TC92-162 & TC92-163:
 - 1) Radial – .015”
 - 2) Axial – .030”
 - c. Flap torque tube bushings TC92-99:
 - 1) Radial – .015”
 - d. Aileron torque tube bushings TW92-52 and TW92-53:
 - 1) Radial – .015”
7. Nylon Cable Guides (Fairleads):
 - a. The wear on these parts must not exceed a point which interferes with the cable routing so as to cause cable chaffing, improper deflection or improper cable tension
8. Hinges – include flap, aileron and trim tab hinges:
 - a. Maximum radial play – .030”
 - b. Lubricate hinges with a quality spray lubricate only as often as required
 - c. Visually inspect:
 - 1) For cracks
 - 2) Loose or fretting rivets
 - 3) For security of hinge pin
 - 4) For general security of the hinge
9. Ball Joints:
 - a. Maximum play:
 - 1) Radial – .005”
 - 2) Axial – .008”
 - b. Visually inspect:
 - 1) For damaged threads
 - 2) For loose lock nuts
 - 3) For bends in thread rod or any other damage to ball joint
 - 4) For freedom of movement in ball joint
 - c. No repair is permitted – Replace worn or damaged ball joints
10. Stabilator Balance:
 - a. Balancing the stabilator is only required after:
 - 1) Completion of stabilator assembly
 - 2) Recovering or repairing the stabilator



- 3) Repainting the stabilator
 - b. The stabilator must be in a completed and airworthy condition with all parts attached to include tips, trim tab control horn, and anti-servo push/pull rod.
Note: The trim tab and anti-servo can be tapped to hold them in a neutral position or as they would be when attached and in a level flight attitude
 - c. Balance the stabilator in a level flight attitude from its hinge points with as little friction as practical
 - d. The stabilator must rest (unassisted) in either a level or leading edge heavy position. **Note:** The leading edge has been designed to be slightly heavy to accommodate a wide variety of covering and excess weight should be avoided as this only adds unnecessary weight to the tail
 - e. Additional weight can be attached to the inboard leading edge ribs to correct a trailing edge heavy condition. The weights and installation instruction can be supplied from the Titan factory other weights may be used only after being approved from the factory
11. Aircraft Weight and Balances:
- a. The aircraft must be weighed and balanced to insure the aircraft falls within the acceptable center of gravity limits and max gross weight
 - b. Weight and balance should be done:
 - 1) At the completion of aircraft assembly
 - 2) With the addition of any equipment not installed during the initial weight and balance
 - 3) Calculated for different pilot, passenger and load configurations
12. Tail Boom Repairs – All tail boom repairs must be approved by the factory:
- a. Area 1:
 - 1) Dents no repair necessary:
 - a. Depth .010" not more than 2 in any 12" length
 - b. Not closer than 2" apart
 - c. Not more than the 2" in maximum diameter
 - 2) Dents Repairable:
 - a. Depth not greater than .0625" not more than 1 in any 24" length
 - b. Not more than 3" in maximum diameter
 - c. Damage exceeding .0625" will require tail boom replacement
 - 3) Scratches or Nicks:
 - a. Class 1 – Scratches or nicks greater than .001" in depth but no more than .005" or 1" in length must be blended out with sand paper only 360 grit or finer
 - b. Class 2 – Scratches or nicks greater than .005" up to .010" regardless of length must be blended out and patched. Blend only with 360 grit



sand paper or finer. Blended area must not exceed 1" beyond damage. Repaired areas must not overlap other repairs

c. Area 2:

1) Dents no repair necessary:

- a. Depth .020" not more than 2 in any 12" length
- b. Not closer than 2" apart
- c. Not more than 2" in maximum diameter

2) Dents Repairable:

- a. Depth not greater than .125" not more than 1 in any 24" length
- b. Not more than 3" in maximum diameter
- c. Damage exceeding .125" in depth will require tail boom replacement

3) Scratches or Nicks

- a. Class 1 – Scratches or nicks greater than .001" in depth but no more than .005" or 1" in length must be blended out with sand paper only 360 grit or finer
- b. Class 2 – Scratches or nicks greater than .005" up to .010" regardless of length must be blended out and patched. Blend only with 360 grit sand paper or finer. Blended area must not exceed 1" beyond damage. Repaired areas must not overlap other repairs

d. Area 3:

1) Dents no repair necessary:

- a. Depth .0625 not more than 2 in any 12" length
- b. Not closer than 2" apart
- c. Not more than 3" in maximum diameter

2) Dents Repairable:

- a. Depth not greater than .1875" not more than 1" in any 18" length
- b. Not more than 4" maximum diameter
- c. Damage exceeding .1875" in depth will require tail boom replacement

3) Scratches or Nicks

- a. All scratches and nicks greater than .002" in depth, but not more than .008' 1" in length or greater must be blended out with 360 grit sand paper or finer only
- b. Scratches or nicks greater than .008 and up to .012 less than 1" must be blended out with 360 grit finer sand paper only
- c. Scratches or nicks greater than .008 and up to .012 over 1" in length must be blended and patched
- d. Blended areas must not exceed 1" beyond damage
- e. Repaired areas must not overlap other repairs



13. Sheet Metal and Structural Damage:
- All sheet metal, welds, and tube repairs or parts replacement should be done in accordance with AC43.13-1A/3 and the assembly manual. **Note:** Welding steel components requires normalizing upon completion of welding
 - Scratches and nicks that penetrate more than 10% of the original material thickness may require further repair. All scratches and nicks must be blended out with sand paper of 360 grit or greater. Scratches and nick in control components and stressed structural components must not interfere with the function of or integrity of that part. Scratches and nicks that cause only cosmetic damage should be filled with a quality compatible filler. **Note:** Fill patches that are subject to vibration or may break loose to cause blockage or binding in controls or damage to the engine or prop may be considered unnecessary
14. Hardware:
- Visual damage or measurable wear to hardware is cause for replacement
 - Information on the identification, torque, usage, or reuse of hardware can be found in the AE43.13-1A/3 chapter 5 and the assembly manual
 - Inspect all hardware whenever it is removed or suspected to be worn or damaged
 - Hardware that connects soft or crushable parts should be torqued to minimum values or as otherwise noted. **Note:** The stabilator eye bolts are equipped with a compression sleeve and should be torqued to the maximum torque as listed in the AC43.13-1A/3
15. D-Cell and Stabilator Delamination:
- Wing D-Cell:
 - Not more than a combined 12 square inches of delamination per 10 ft. length of the D-Cell
 - Stabilator leading edge structure:
 - Not more than a combined 6 square inches of delamination per 24" length of stabilator leading edge
 - Repair:
 - Repair all delamination if it is beyond above limits
 - Drill .25" holes in skin over delamination not more than 3" apart
Note: Holes must cover entire effected area
Note: On D-Cell, holes must only be drilled on foam rib
 - Inject in each hole enough uralane to thoroughly saturate foam
 - Clamp disbonded area with enough force to hold skin tightly to foam
 - Allow 24 hours to cure
 - Fill (with a compatible body filler) and repaint repair area
16. Replace nose fork and landing gear legs:
- Remove damaged fiberglass legs by applying heat (propane torch) while pulling and twisting simultaneously. Apply heat only to the steel component bonded to the fiberglass and not to the fiberglass itself
 - Clean parts thoroughly before bonding replacement rods
 - Rough areas are to be bonded with 80 grit sandpaper



- d. Bond with 2 part proxy, available through Titan factory
 - e. Parts must be held in place until glue is completely dry
 - f. Main landing gear legs must be pushed into spindle completely
 - g. Nose fork rods should be 8" long and should not extend through, but rather ride flush with the end of the rod. The length of both rods must be the same to ensure the axle rides parallel to the ground. The axle should be used to hold the alignment of both buckles. See drawing B92-INS-176 for proper location of buckles on nose fork
17. Lubrication – All airframe hinges, pivot points and wear areas (except ball joints) that call for lubrication on the inspection checklist will be lubricated with lithium grease or a high quality multi-purpose grease unless otherwise noted.
18. D-Cell Damage Criteria/Repair:
- a. Scratches and nicks:
 - 1) All scratches or nicks deeper than .005" must be blended with 360 or greater grit sand paper
 - 2) No more than 3 blended repairs per 24" length of the D-Cell
 - 3) No 2 repairs may overlap each other
 - b. Dents:
 - 1) All dents that deform, misalign, or in any way show adjacent member must be repaired and investigated completely to determine the extent of the damage before a repair is made.
 - 2) D-Cell repairs must include the repair of any internal or adjacent part/parts that are affected
 - 3) Damaged D-Cell sections may be removed and replaced with a D-Cell splice. The size of the splice will be determined by the size of the damaged area. Approved D-Cell splices are available through the Titan factory only and the size of the repair must be approved prior to ordering a splice. See drawing B97-INS-0892

