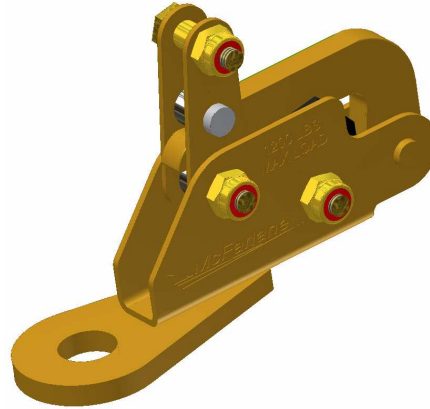




TOW HOOK INFORMATION, INSTALLATION, INSPECTION AND SAFETY INSTRUCTIONS

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General Information

The Wings Unlimited tow hook has many advantages over the previously available tow hooks in the area of release safety. Our redesigned hook and hook body prevents the towline ring from moving forward under unusual high tow angles. This prevents excessive loading and jamming of the release arm. The release assembly has geometry improvements that provide additional leverage and a hardened roller reduces release friction. Both improvements increase the release capability of the tow hook. The result is that the Wings Unlimited tow hook will dependably release the tow load with less applied release force than previously available tow hooks. This is especially true for heavy tow loads at abnormal and severe tow angles.

As shown in Table 1, the release force required to release the tow load is proportional to the tow load and varies with the angle of tow. This table was created by measuring the typical release forces required at the given load and angle using a new hook without wear or defects. The maximum design load for the Wings Unlimited tow hook is 1200 lbs. This load rating has been tested using a safety factor of 2.0 (2400 lbs) without any failure.

Wings Unlimited tow hooks are furnished in two design configurations to accommodate either a bolt on or weld on application. This installation, inspection and safety instruction sheet applies to both configurations. Failure to comply with these instructions could result in improper operation of the assembly, damage to equipment and injury or death.

The Wings Unlimited tow hook is not FAA-PMA approved for any specific application. FAA approval must be obtained for the complete tow hook installation as a system by the installer. The tow hook assembly installation must be accomplished in accordance with this document, FAA Advisory Circular 43.13-2B, Chapter 8, titled, "Glider and Banner Tow-Hitch Installations, applicable aircraft manufacturer's installation instructions or other applicable data.

The forces required to drop the tow line by itself is **much less** than the forces required to release a glider or banner under load. Many tow hook installations have been installed without regard to the higher release force required during an emergency situation where the tow load and or the tow angle are high. Fatal accidents are likely if the tow line cannot be released in an emergency.



In the design and installation of a tow release system sufficient attention must be applied to the pilot's release lever system. The system is composed of the release lever and cable, and may include pulleys, conduit to guide the cable, and conduit clamps. Release cable routing from the pilot's release lever to the tow hook's release arm is also critical as slack or a lack of rigidity in any conduit or pulley attachment will consume available cable travel and release effort, or could cause unwanted releases. The release lever system must be capable of providing enough force to release the rated maximum load of the tow hook at all angles. The "limit load" is defined in AC43.13-2B; Section 804; Paragraph d.

Tow hook release forces become greater as the tow load and angle of tow increase. Table 1 gives the required release force for a given angle of tow hook load. The release forces listed in Table 1 must be used as a starting point in the design of a release system. For example, assuming a *limit load* of 1200 lbs; by referencing Table 1 we can see that a 1200lb. load will require a release force of 68 pounds at the most adverse angle. The pilots release lever system must be capable of delivering at least 68 pounds of release force to the release arm of the tow hook.

FAA Advisory Circular 43.13-2B requires a sufficient handle/lever ratio to assure adequate release force when the tow line is under high loads. The referenced Figure 8-3 in AC43.13-2B implies a leverage ratio of 5:1. It must be noted that this leverage ratio is given as an example. A leverage ratio greater than 5:1 may be required. For example: We can determine the pilot effort required to release a 1200lb. load with a pilot release lever ratio of 5:1 by dividing the required release force from Table 1 by the leverage ratio. $68/5=13.6$ pounds of pilot effort. We can also easily determine the amount of pilot effort a greater leverage ratio would yield. For example a leverage ratio of 6.5:1 yields: $68/6.5=10.46$ pounds of pilot effort. The installer must determine the appropriate leverage ratio for his installation and assure that reasonable pilot input forces are capable of exceeding the highest required tow hook release force listed in Table 1.

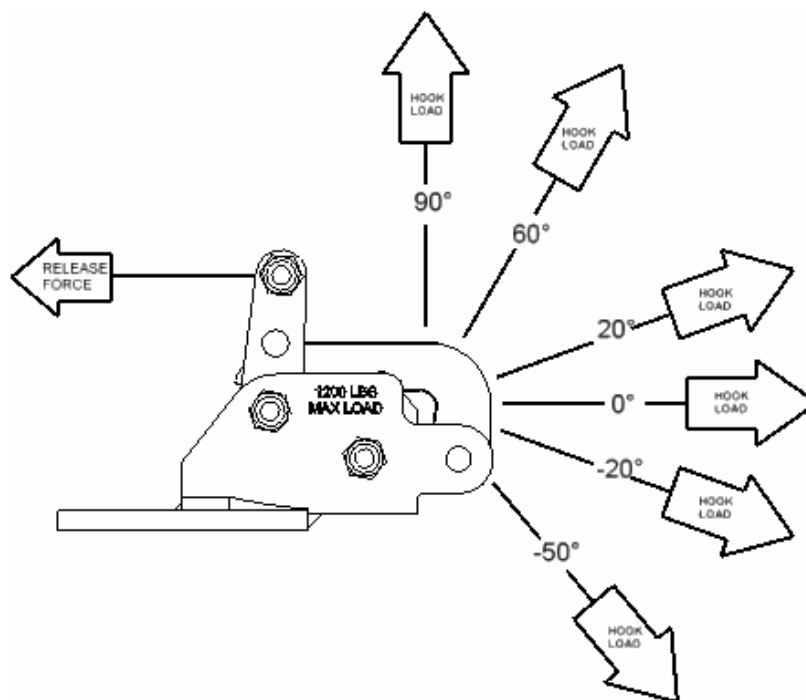


Figure 1. Tow hook Load Angles Referenced in Table 1.



Table 1. Release Force Requirements in Pounds for Various Hook Load and Load Angle Combinations.**

LOAD ANGLE (Degrees) HOOK LOAD (Pounds)	-50	-20	0	20	60	90
100	16	8	8	10	14	12
200	24	14	14	16	20	18
300	32	20	20	22	24	19
400	32	24	25	28	32	23
500	37	28	30	34	36	30
600	40	34	36	40	44	34
700	42	38	38	41	46	38
800	46	42	42	44	52	42
900	47	46	48	50	56	46
1000	48	50	51	56	62	48
1100	52	50	54	60	66	50
1200*	54	54	60	64	68	54
1300*	56	62	67	70	80	58
1400*	55	62	74	72	82	59

*: 1200 pounds is the rated maximum load for the Wings Unlimited tow hook. Release forces for 1300 and 1400 lbs are provided for reference only. This Table represents typical test results from a new tow hook without wear or service defects.

** : Table 1 is applicable only to the Wings Unlimited Tow hook. Other tow hooks require much more force.

WARNING

The tow hooks are designed specifically for aircraft that tow gliders and aircraft that tow banners. The tow hook is **not** to be used on gliders as a tow release. The installer must determine the suitability of the tow hook design and installation before using these tow hooks for any other purpose. Improper installation and use of a tow hook can lead to damage of property, injury and death.



System Requirements

It is important that the tow hook system is properly installed. In addition to the requirements of AC43.13-2B Wings Unlimited requires the following elements for a tow hook installation:

- All tow hook installations must utilize an in-line pull release cable. The release cable routing must not create any side load pull on the release arm.
- Cord and rope are not acceptable for tripping the release. Steel or stainless steel aircraft type control cable must be used with aircraft type mil-spec or Nicopress swaged terminals.
- Release cable routing in conduit requires a conduit, where used, to be of sufficient size and construction and securely clamped to the airframe in a manner and frequency that limits deflection of the conduit when the tow hook is tripped.
- Where pulleys and fairleads are used for the release cable; all pulleys and fairleads must be securely attached to the aircraft and neither the cable nor pulley may interfere with any other aircraft system or component.
- The release cable routing must not create excessive drag on the release cable.
- The pilot release mechanism in the cockpit must be designed to provide sufficient leverage to release the towline when highly loaded. The tow hook release must not be operated by pulling a rope or cable by hand to release the tow load. **It is essential that the system includes a pilot operated release mechanism with a leverage ratio that ensures adequate release force can be applied to the tow hook during an emergency release situation at adverse tow angles.**
- The pilot release lever must be designed to prevent accidental release of the tow hook.
- The Wings Unlimited tow hook must not be modified. The Wings Unlimited tow hook was designed for and must be used with a Wings Unlimited P/N 6131 tow ring (21/4-inch O.D. x .25-inch cross section, forged, heat treated, and proof loaded). **Do not use any other tow ring.** Using any other tow ring could cause jamming or release failure,

Installation

Tow Hook p/n 6027 and 6028 Installation Notes

Tow hooks p/n 6027 and 6028 are to be welded to a bracket of the installers design. This allows mounting of a tow hook on aircraft where the bolt-on style will not work. Before welding the tow hook on a bracket or other type of mounting device remove the rubber spring, the bolts, and the elastic stop nuts to prevent damage caused by heat from the welding process. The hook pivot pin is retained with silver braze. Avoid the application of heat to the hook pivot pin as this may damage or weaken the silver braze joint. The hook is heat treated alloy steel. Protect the hook from heat produced during welding. To insure a good weld remove the protective black oxide coating from the area of the tow hook to be welded. This may be accomplished with sand paper. The use of a grinder or powered belt sander should be avoided as accidentally grinding to deep in the housing may weaken the tow hook installation. After welding clean and paint the tow hook with a high quality primer and paint. The thickness of the paint layer should be held to a minimum so that the paint doesn't inhibit operation of the hook or the hook release.

Weight of the p/n 6027 tow hook is .355 lbs.

Weight of the p/n 6028 tow hook is .425 lbs.

Tow Hook p/n 6029 and 6030 Installation Notes

Tow hooks p/n 6029 and 6030 are provided with a mounting lug that allows attachment of the tow hook to an existing anchor point on the aircraft. Many aircraft use the tail tie-down mounting point to take advantage of pre-existing structural reinforcement associated with the tail tie-down. Installations where the bolt hole diameter in the tow hook's mounting lug is larger than the tie down bolt diameter will require a spacer or bushing to be fabricated. The tow hook must not swivel on the tie-down bolt or spacer.

Weight of the p/n 6029 tow hook is .507 lbs.

Weight of the p/n 6030 tow hook is .537 lbs.



All Tow Hook Installations

The tow hook installation must be accomplished in accordance with FAA Advisory Circular AC43.13-2B or later revision. The system requirements listed above must be incorporated into the installation. After completing the installation and before placing the tow hook in service:

1. Complete the functional test.
2. Perform the "Tow Hook System Preflight Checks" as listed below.
3. Perform all inspection items in the "Scheduled Aircraft Inspections" list given below.

Functional Test

To insure functionality of the tow hook, a functional test must be performed.

Test 1 No Load Hook Release Test

Measure the release effort applied to the tow hook release arm with a tow ring in place and zero load on the hook. A calibrated spring scale or other calibrated force measuring device must be used for this test. The release effort must be within the parameters of Table 2.

Table 2. No Load Release Force

Test	Hook Load (Pounds of Force)	Release Effort
1	Zero (0) lbs*	4 lbs Minimum 10 lbs Maximum

*: Wings Unlimited P/N 6131 Tow Ring must be latched in tow hook for test as shown in Figure 2.

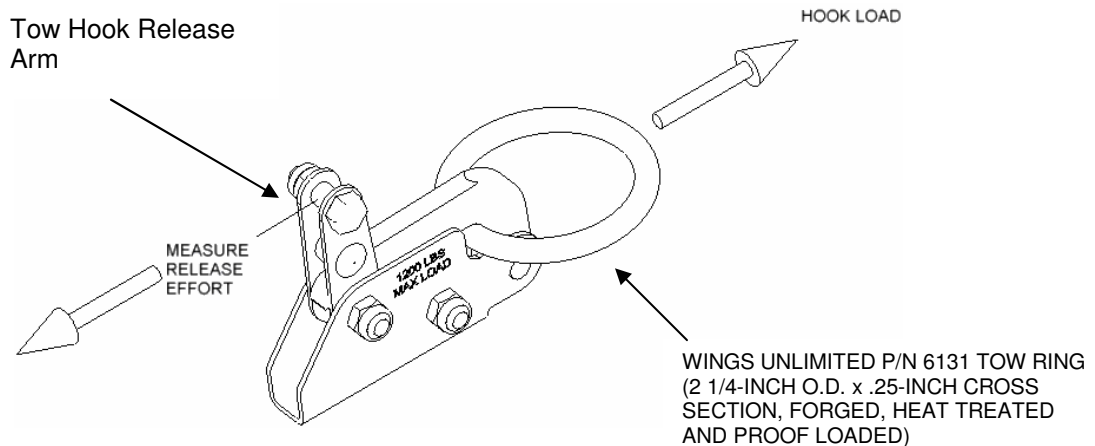


Figure 2.

Test 2: Aircraft Release System Functional Test

Purpose: To assure that sufficient force is available to the tow hook release arm when using the aircraft release system. By measuring the force at the tow hook release arm, this test also accounts for friction and other losses in the aircraft release system.

Determine the Required Test Force: Determine the *limit load* of the tow hook installation per AC43.13-2B Section 803; Paragraph d. Find the row on Table 1 that lists the hook load equal to the *limit load*. From this row on Table 1, determine the highest required release force listed. This is the required test force. For banner tow, use the calculated test force or a 36 pound test force whichever is the greater.

Test Setup: Position the tow hook in the closed position. Hook a calibrated spring scale to the release cable at the tow hook release arm. Pre-load the spring scale to read less than the test force. An improvised lever is sometimes required to hold and stabilize the spring scale. Reference Figure 3.



Test Procedures: Observe the spring scale reading while the pilot applies a reasonable effort to the pilot operated release lever in the cockpit. Several tests might be required to determine the proper pre-load on the spring scale.

Test Acceptances Criteria: The spring scale must read the required test force or higher and the hook must also release.

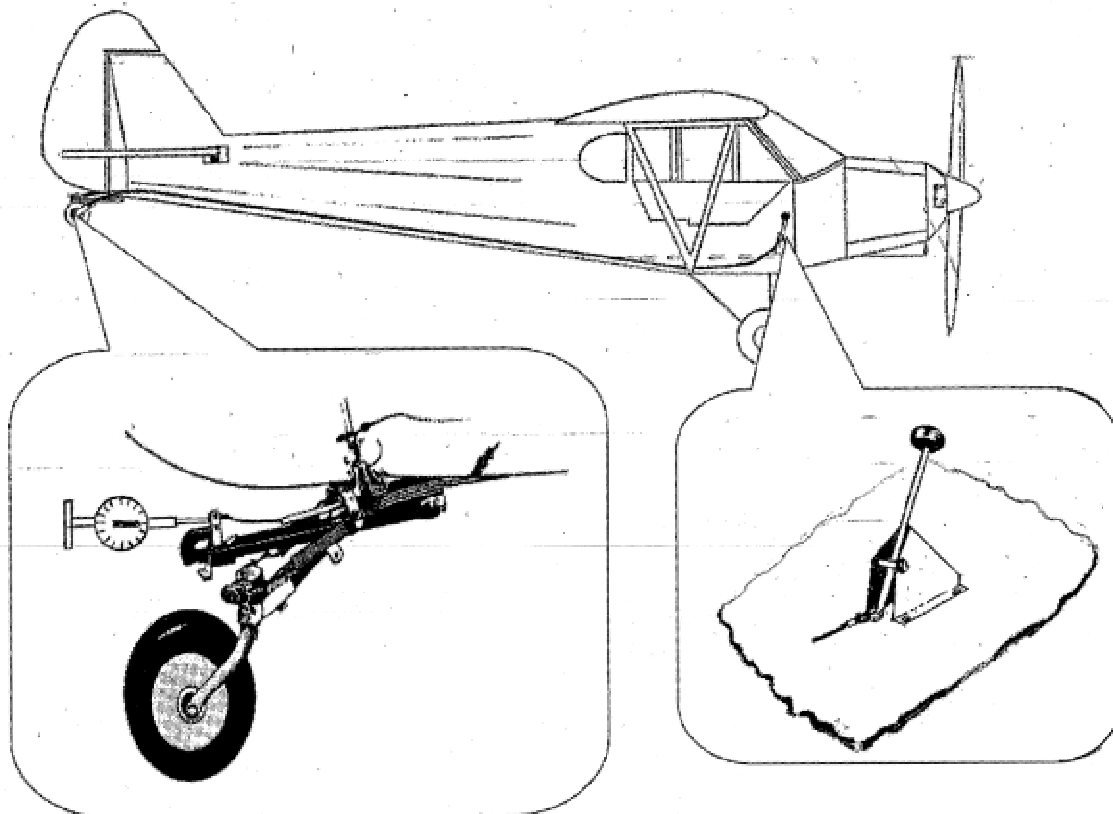


Figure 3.

PLACARD REQUIREMENTS

Placard per AC43.13-2B; Section 807.

MAINTENANCE RECORD REQUIREMENTS

A. Statements substantiating compliance with the testing requirements specified herein must be entered and certified in appropriate log or other type of record in compliance with FAR 91.407(a)(2)(c).

B. This form shall be retained as part of the permanent aircraft maintenance records and must be transferred with the aircraft at time of sale in compliance with FAR 91.417(b)(2)

WARNING

Failure to comply with the functional tests could result in operational failure of the release system causing damage to property and/or injury or death to persons. An emergency release might not be possible if the aircraft release system does not have sufficient release force capacity.



WARNING

Failure to comply with the Instructions for Continued Airworthiness could result in failure of the tow hook, causing damage to property and/or injury or death to persons.

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

There is no life limit on the Wings Unlimited tow hook assembly. The hook or components as applicable should be replaced when they do not pass the following inspections.

Hook System Pre-Flight Checks

Tow Hook

Assure that the proposed use of the tow hook system is within the structural design limits as per the cockpit placards.

Check the tow hook installation before use insuring that the tow hook:

1. is securely mounted to the aircraft
2. has no loose or missing fasteners
3. is free from cracks
4. assembly has no sign of distortion
5. release arm smoothly pivots throughout its range of travel
6. does not bind at pivot points
7. release arm rotates freely
8. does not contact the rudder or other aircraft structure
9. rubber spring has sufficient force to maintain hook engagement in the release arm
10. rubber spring is not excessively hard and that the rubber material does not have a permanent indentation created by the hook
11. bumper is intact and secure, in good condition not showing signs of weathering or missing pieces. The bumper must not be worn in a manner that allows the hook to contact the metal frame of the tow hook housing (*This inspection item applies to models equipped with the tow hook stop; Models 6028 and 6030*).
12. passes the functional test described below

Tow Hook Functional Test

1. Close and latch the tow hook with a tow ring in place verifying that sufficient force is required to compress the rubber spring with the hook and that the hook applies sufficient locking load against the release arm after it is engaged.
2. Verify that movement of release arm towards the release position causes additional compression of the rubber spring.
3. Test the tow ring clearance to the tow hook as shown in Figure 4. The tow ring must rotate without binding. Rotate the tow ring to the opposite vertical position verifying there is no binding of the tow ring.
4. Activate the tow release using the pilots release lever. The tow hook must release the tow ring without undue effort or roughness of operation.

Tow Ring Preflight Check

1. Ensure that the tow ring is free from distortion.
2. Ensure that the tow ring is a Wings Unlimited p/n 6131 (2 1/4-inch outside diameter, .25-inch cross section, forged, heat treated, and proof loaded).

If any of the above are found defective, correct the defect or replace the tow-release hook assembly prior to use.

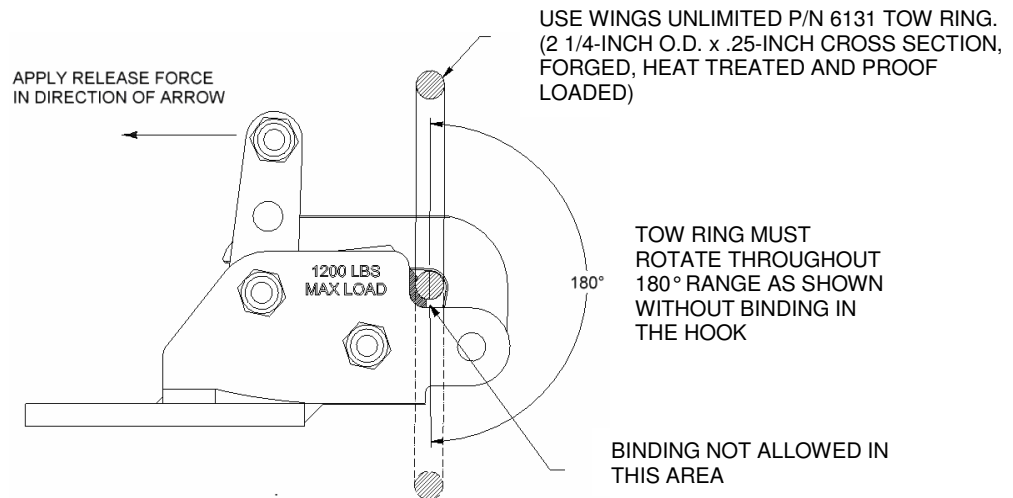


Figure 4. Tow Ring Clearance Test

SCHEDULED AIRCRAFT INSPECTIONS and SUSPECTED TOW HOOK OVERLOAD INSPECTION

Perform the operational checklist inspections above and the following inspections:

1. Security and condition of rubber spring.
2. Pivot points for excess play or looseness of fasteners.
3. Inspect the base weld assembly for cracks using a 10X magnifying lens. If cracks are suspected perform a dye penetrant inspection on the suspect area. If a crack is found the hook assembly must be removed from service.
4. Inspect the silver braze joint at the hook pivot for cracks using a 10X magnifying lens. If cracks are suspected perform a dye penetrant inspection on the suspect area. If a crack is found the hook assembly must be removed from service.
5. Inspect the release assembly rivet for condition and security.
6. Inspect the release assembly roller for operation. The roller must rotate freely. Clean and lubricate roller as required.
7. Inspect the release cable attach point on the release arm for security and excess wear.
8. Inspect the hook for excess wear caused by the tow ring.
9. Measure the "no load" release effort with a tow ring installed in the hook and verify that it meets the release effort specification listed in Table 2 of the installation section.
10. Verify that the arc traveled by the hook when released, completely clears all parts of the aircraft. **Note: The tow hook has tremendous kinetic energy when released under load. To avoid damage to the aircraft or jamming the flight controls, it is essential that the hook does not contact any aircraft structure or control surface when released. Insure the hook travel arc has clearance with all control surfaces in all positions throughout their full range of travel.**
11. If a tow hook overload is suspected to have occurred; inspect the aircraft structure for damage caused by the overload.
12. Check cockpit placard. Placard must show structural design limits of the tow system and must be conspicuous and easily readable by the pilot.

If any of the above are found defective, correct the defect or replace the tow-release hook assembly prior to use.

Contact Information

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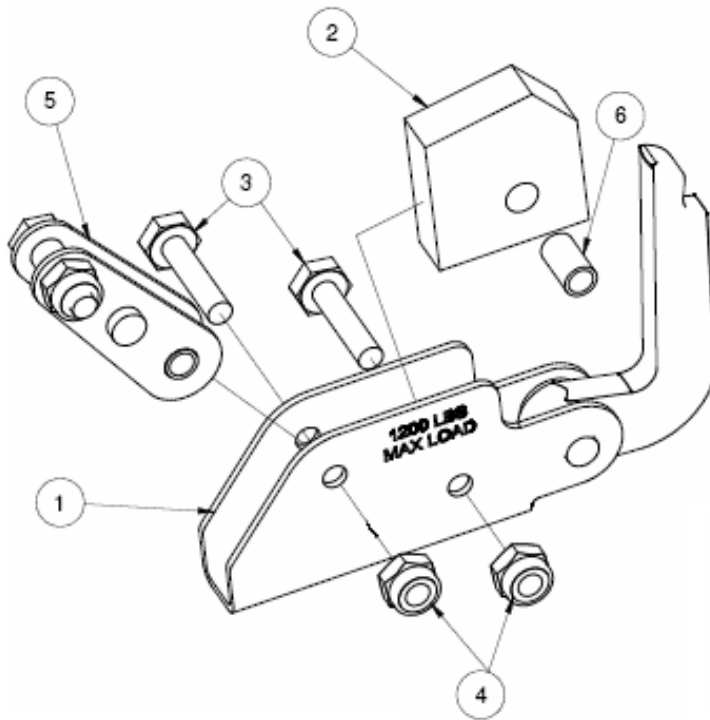


Figure 5. P/n 6027 Exploded Parts View

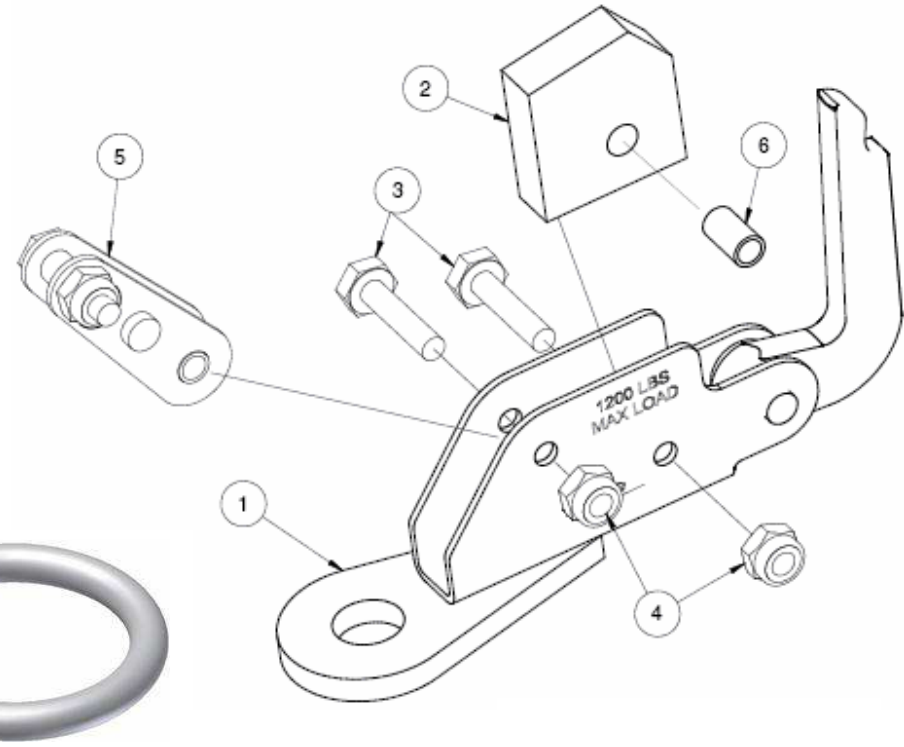


Figure 6. P/N 6029 Exploded Parts View

P/N 6027 PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6022	HOUSING/HOOK SUB ASSEMBLY
2	1	6017	RUBBER SPRING
3	2	AN3-7A	BOLT
4	2	MS21044N3	NUT
5	1	6025	RELEASE ASSEMBLY
6	1	6014	BUSHING

P/N 6029 PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6024	TOW HOOK ASSEMBLY
2	1	6017	RUBBER SPRING
3	2	AN3-7A	BOLT
4	2	MS21044N3	NUT
5	1	6025	RELEASE ASSEMBLY
6	1	6014	BUSHING



Wings Unlimited, inc.

**TOW HOOK INFORMATION,
INSTALLATION, INSPECTION AND SAFETY
INSTRUCTIONS**
Drawing 6038 Revision: G Nov. 24, 2009

NOTE 1.
TO ASSEMBLE STOP BUMPER MODELS;
INSERT THE PIN (ITEM 8) THROUGH THE
HOLE IN THE HOUSING (ITEM 6) INTO HOLE IN
THE STOP BUMPER (ITEM 7). NOTE THAT PIN
IS RETAINED BY RUBBER SPRING (ITEM 1).

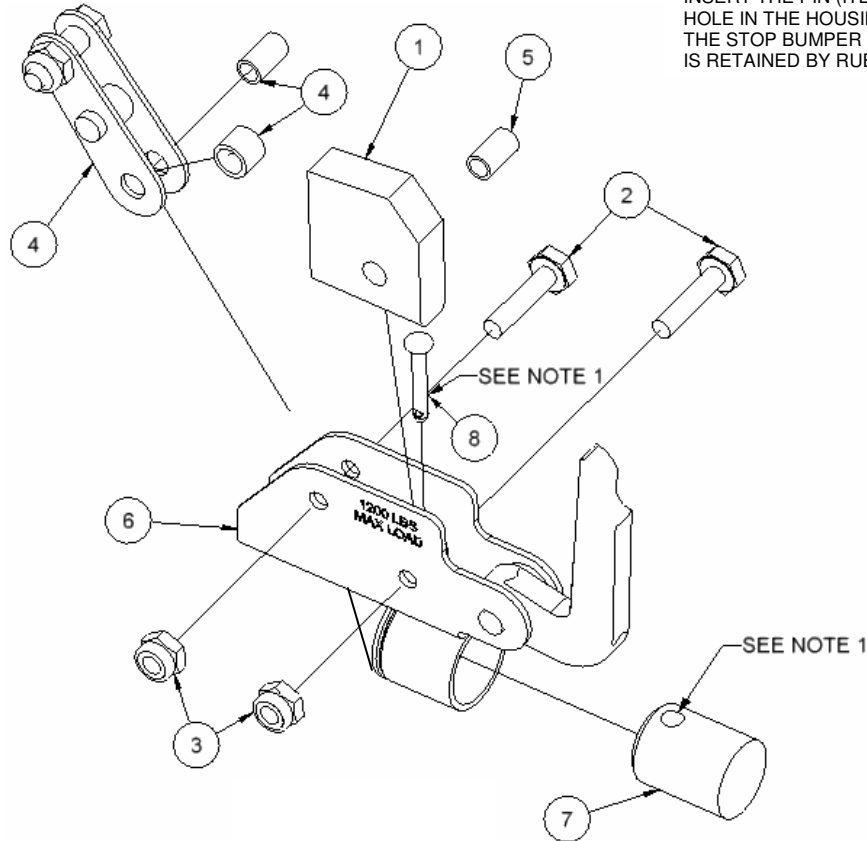


Figure 7. PN. 6028 Exploded Parts View

PN. 6028 Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	6017	Rubber Spring
2	2	AN3-7A	Bolt
3	2	MS21044N3	Nut
4	1	6025	Release Assembly
5	1	6014	Bushing
6	1	6051	Housing/w/Stop
7	1	6046	Stop Bumper
8	1	6049	Pin

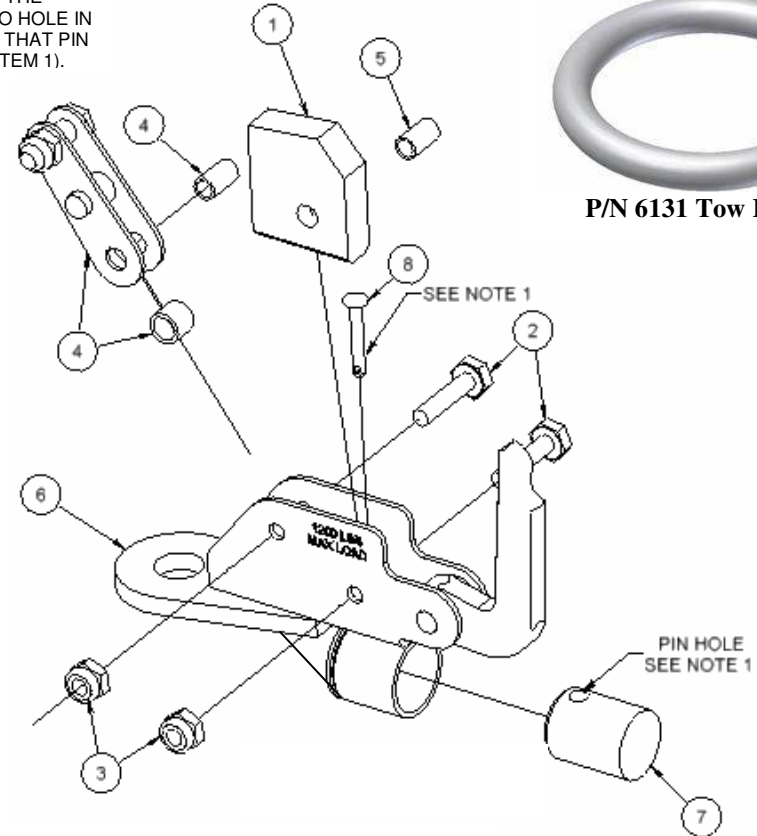


Figure 8. PN.6030 Exploded Parts View

PN. 6030 Parts List			
ITEM	ITEM	ITEM	ITEM
1	1	6017	Rubber Spring
2	2	AN3-7A	Bolt
3	2	MS21044N3	Nut
4	1	6025	Release Assembly
5	1	6014	Bushing
6	1	6050	Housing/w Lug/w/Stop
7	1	6046	Stop Bumper
8	1	6049	Pin

