Northern California Soaring Association

Tow Pilot Manual

Coordinating Author:	John J. Scott N4116Y Crew Chief and Tow Pilot
Approved By:	Paul McDonald NCSA Chief Tow Pilot
Approved By:	NCSA Board of Directors

Revision: 1 Issue Date: January 16, 2017

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Section 1 Qualifications and Approval

Chief Tow Pilot Approval

A prospective tow pilot must be vetted and approved by the Chief Tow Pilot.
The Chief Tow Pilot will review the candidate's experience and qualifications. The Chief Tow Pilot will fly with the candidate to verify required airmanship skills and to provide an orientation to glider towing and to unique conditions at Byron. The Chief Tow Pilot will ensure that the prospective tow pilot has the requisite skills, knowledge, and experience, and has met the stated requirements of this Section.
The Chief Tow pilot will then inform the new Tow Pilot that he may tow the general population. The NCSA Board must also be notified.

Pilot Experience and Qualifications

Both prospective and existing tow pilots must have:

- NCSA tow pilots must be members of NCSA.
- Private Pilot certificate or higher with an airplane single-engine land rating.
- Experience > 100 Hours as PIC in ASEL.
- Current Third Class medical certificate or higher.
- Current Flight Review [FAR 61.56]
- Current Flight Experience [FAR 61.57]
- Tailwheel Endorsement [FAR 61.31(i)] plus a minimum of 25 hours of tailwheel time.
- Glider Towing Endorsement [FAR61.69]

NCSA Specific Tow Pilot Training

The NCSA Chief Tow Pilot, or his designee, will ensure that specific training is provided to the prospective tow pilot prior to his towing the general population.
This area specific training shall include the following:

- Complete the Soaring Safety Foundation (SSF) on-line Tow Pilot Course.
- Minimum of three (3) training flights towing a glider containing either a tow pilot or a CFIG. During these flights the following must be practiced and satisfactorily demonstrated.
    - *Hook Up and Launch Procedures*
    - *Pattern Tows*
    - *Rope Breaks*
    - *Slack Line*
    - *Box the Wake*
    - *"Off Tow" Procedures*

Section 2 Operating Procedures

This section discusses tow plane operating procedures and, in many cases, provides procedures that are specific to N4116Y. This discussion assumes that the tow plane has conventional gear. The following is intended to be a guide to NCSA-unique towing procedures, and is not an exhaustive description of all towing considerations. Refer to the Glider Flying Handbook, Chapters 7 and 12, or the Towpilot Manual by Burt Compton for additional information. Another excellent reference is Aerotowing Gliders by John Marriott. Numerous other texts and websites exist.

Tow Pilot Safety Responsibilities

The Tow Pilot is responsible for the safety and proper operation of the tow plane and coordination with ground crew during hook up operations.
The Tow Pilot shall not leave the pilot's seat while the prop is turning.
The Tow Pilot may refuse to perform a tow for any reason.
During the tow, the Tow Pilot is in charge of the flight.
It is an NCSA requirement that tow pilots must meet the currency requirements of FAR 61.57 (carrying passengers). This can be regained by performing 3 takeoffs and landings within 90 days prior to towing a glider.

N4116Y Description

The NCSA tow plane is a 1976 Scout (8GCBC) made by American Champion Aircraft. It has a Lycoming 0-360 carbureted 4 cylinder engine that generates 180 HP. It is a conventional gear aircraft with a steerable/full castering tailwheel. Our aircraft has long range fuel tanks that can carry up to 70 gallons of fuel. Our typical burn rate is about 10 GPH per tach hour. The engine has an Impulse Coupler on the left mag only. The aircraft has been well maintained. It was upgraded to the metal spar wing and the fuselage was recovered in 2014.
Maximum Cylinder Temperature: 450 °F
Maximum Oil Temperature: 240 °F

Preflight

The tow pilot shall conduct a thorough preflight of the tow plane. It's particularly important to inspect the tires for condition and inflation, drain water from fuel tanks and lines (not while inside hangar), and check the condition of the landing gear attachments, tailwheel springs, brakes, and tow rope. If the fuel tanks are not appropriately filled, refuel before flight operations commence. 16Y has long range fuel tanks (70 Gallons) and it is not necessary that they be completely full to start.

16Y uses a tow rope retraction winch. As part of the preflight the tow rope should be withdrawn and inspected.

16Y's tailwheel is "steerable" with full castering detents. These features improve ground handling by providing lateral resistance to weather vaning. Astute tow pilots should be cognizant of these features working correctly.

Oil

Maximum oil capacity is 8 quarts. The oil level should be maintained at or above 6 quarts as measured when cold. If the oil level is found below 6 quarts at the start of an operating day, the tow pilot should add oil to bring the level up to at least 6 quarts.

Tires and Brakes

Main wheel tire pressure is 20-22 psi; tail wheel pressure is 40-50 psi.
The main wheel tires are low pressure tires and a visual inspection for pressure may not be sufficient. The pressure should be checked with a gage. Tire gages are located in the bottom drawer of the Red Toolbox.
The tailwheel tire can be assessed visually. The tailwheel tire is properly inflated if the sidewalls are firm and without sidewall bulging.

Fuel Caps

16Y has two fuel tanks with a common feed (no tank selector valve). The fuel tanks are vented with a common pitot tube type inlet pipe which maintains a slight positive pressure in the tanks. The two tanks are supposed to drain evenly. Tow pilots should confirm that both tanks are draining equally. If not, check the condition of the gaskets on both fuel caps. Replacement fuel caps are maintained in the hangar. A defective gasket will allow the vacuum on the top of the wing to reduce the positive pressure in that tank resulting in unequal fuel draw. The tank with too much fuel is the tank with the bad gasket.

Tow Rope, Winch, and Rope Retraction

After pulling the plane from the hangar, turn the plane to face east and continue the preflight inspection by withdrawing the tow rope. Perform a visual inspection of the entire length. A damaged rope will need to be replaced.

The tow rope winch control circuit utilizes a hold-on (latching) relay and a current sensing relay. Pushing the button forces the motor on and latches the hold-on relay which is connected to the current sensing relay. The motor continues to run after button release because of the latching relay. When the current sensing relay sees high current flow in the motor it drops the hold-on relay and the motor stops. This happens when the rope is fully retracted and "stalls" the motor. However, this can also happen if retraction is attempted at too high of an airspeed. The winch will start to retract as you hold down the button but after button release the motor will stall if the wind drag on the rope is too great. The winch then coasts backwards and re-deploys the rope. Something very similar will happen if there is a knot in the rope. The rope will start to retract, the knot hits the guide and stalls the motor, and then the rope re-deploys.
Remember to retract the tow rope prior to landing. This will require slowing the plane to below

80 MPH and will take about 25 seconds. Once the rope is in you can accelerate to a higher airspeed for your return to the airport. Flying the plane at high airspeed with the rope out runs the risk of putting a knot in the rope.

For the reasons mentioned, it is important that the tow rope be part of your pre-landing checklist. If you notice the rope is still out on Base or Final, you should consider abandoning your approach. Trying to deal with a still deployed tow rope late in the pattern is a good way to get distracted and make mistakes. Beware of the simulated rope break that may have you landing on either R23 or R05. There are barb wire fences on short final for both R23 and R05. If the rope is still out and you don't realize it, you're may land short and snag one of these fences.

If a loop forms on the reel, it may snag on the winch shields when the wing runner withdraws the rope. If this happens it may be necessary to disconnect the glider and taxi off the runway to clear the jam.

Starting Procedures

The engine is started with both mags ON.
Recommended starting procedures vary slightly depending on whether the engine is warm or cold.

Engine Cold
For the first start of the day prime 3-5 strokes.

Engine Warm
Do not use the primer. Give the engine one full throttle stroke.

Perform Pre-start cockpit check:

- Controls free
- Seatbelt fastened
- Mixture rich
- Flaps up
- Battery master on
- Crack throttle open ½ inch
- Announce "CLEAR PROP"
- Engage starter

After start, keep RPM below 1000 while waiting for oil pressure to rise above minimum pressure. Shut down the engine if no oil pressure indication is noted within 30 seconds.

The engine in 16Y should start easily. If it does not, then something is wrong. Contact the Crew Chief.

Taxi

16Y has conventional gear so it is important to hold the stick properly during taxi. Controls should be set to "climb into or dive away" from the wind as required. Be vigilant for ground personnel or obstructions. Perform "S" turns as needed for visibility.

Runup

Perform the daily runup in accordance with standard operating procedures. The runup setting is 1800 RPM. As a minimum, check mags, carb heat, and controls for freedom of movement, brakes, and fuel quantity.

Mixture and Leaning

Tow pilots should be very attentive to leaning to avoid carbon fouling of the plugs. Our glider towing operations involve a greater than normal amount of ground operations which makes us more susceptible to this problem.
Normally there are only two times when the mixture should be full rich; (1) engine start and (2) takeoff/climb. During ground taxi the mixture should be "aggressively leaned". This means leaning until the engine almost stumbles. During runup the engine should be leaned to "maximum power". This is the mixture setting that gives maximum RPM. Tow pilots should take note of this setting for future reference (i.e. position of the knob).
During climb, the engine may be leaned to maximum power when above 3,000 feet density altitude. This should also be done after glider release for the return flight and for landing.

First Flight of the Day

NCSA encourages tow pilots to make a check flight each towing day to check out the tow plane's systems and to re-familiarize themselves with the plane's handling. A simple pattern may be sufficient. If the tow pilot has not acted as pilot-in-command within the last 90 days [current to carry passengers] now is a good time to do your three landings.

Stopwatch

NCSA charges tows by time. The stopwatch should be started when first taking the runway. The stopwatch should be stopped when exiting the runway. Tow pilots have the prerogative to subtract time from the total elapsed time when there is a delay not due to the glider pilot (i.e. a go around, delays due to traffic).
If the glider takes the runway and then delays because they were not ready, then they pay.

Glider Launch Procedures

When the wing runner signals that they are ready for you, start up and taxi to a position safely in front of the glider to be towed. With your engine at idle, the wing runner will withdraw the tow rope and attach it to the glider.

NCSA requires a successful radio communications check. This may be initiated by either the

glider or the tow plane. If the communications check is unsuccessful, the launch shall be terminated. Successful radio communications are an NCSA pre-launch requirement.

With all personnel clear of the glider (not in front of the wing) the wing runner or pilot may give the signal to "take out slack". The wing runner may signal when to stop by holding both arms out to the sides of his body or above his head (standard SSA glider signals). However, in 16Y, it is easier to view the winch spool in the upper left review mirror. As you taxi forward, observe the tow rope deploy from the reel to determine when all the slack is out. After stopping, confirm the pre takeoff check list and wait for the takeoff signal.

With the glider wings level, the glider pilot should radio his readiness for takeoff and waggle his rudder. The wing runner should give his takeoff signal. NCSA does a lot of instructional flights. Students often get confused, both pilots and wing runners. Do not feel obligated to take off. If there is any question about readiness, get on the radio and make them get it right.

For safety reasons (dust devils, wind gusts) do not climb out of ground effect too soon. Hold the plane in ground effect as you accelerate to climb speed and then begin the climb. Do not zoom up. It is extremely difficult for a new student to follow this type of maneuver. The need for acceleration in ground effect will be even more noticeable for heavy, two-place gliders. Avoid any abrupt changes in your climb angle.

Do not perform a takeoff if the glider wing is down. Less experienced pilots often make this mistake. Wing runners assume that no takeoff will occur while they are holding the wing down. Occasionally, takeoffs will be made with the wing of the glider resting on the ground (unassisted takeoff), but you must be informed of this in each individual case. Also, some pilots like to takeoff with partial spoilers. These are all exceptions that must be communicated to the tow pilot and wing runner before attempting to launch.

<u>Unless you are specifically briefed to do something different ahead of time</u>, never start your takeoff unless:

1. Glider wings are level
2. Spoilers are closed
3. Canopy is closed
4. All line crew are clear (nobody is standing in front of the wing)
5. You get the radio call ("Standby for rudder" or "Ready for takeoff")
6. You see the rudder wag and/or Wing runner gives takeoff signal
7. The runway and pattern are clear

If the takeoff is aborted, pull off to the left side of the runway, if possible. Do not stop short; keep the tow plane rolling so the glider does not rear-end the tow plane. The glider should pull off to the right, but as some gliders lack directional controllability at low speeds, you cannot depend on the glider pilot being able to point the glider where he or she wishes.

If you feel the tow line break during takeoff, even though you may believe you can stop the tow plane before you reach the end of the runway, continue the takeoff so the glider will have a clear shot at an emergency landing (rollout w/o hitting the tow plane). Emergencies rarely happen, but they do happen, so you should constantly keep in mind what you would do if one did occur.

During takeoff, be especially alert to the possible emergency situation that may require pulling the emergency release handle. The emergency release triggers a guillotine that cuts the rope. "Controls-to-the-stop" justifies an immediate release. Other situations will require a judgment call. If there is doubt about a safe outcome for the tow plane and pilot, then pull the emergency release.

Premature Termination of the Tow (PT3)

In the event of an actual or simulated rope break, or any other PT3 event, continue to fly straight ahead while maintaining awareness (preferably sight) of the glider's location. Do not reflexively turn left as soon as the glider is off tow, but rather continue to climb to pattern altitude and then fly a normal pattern for landing, always giving the glider priority for all runways.

V Speeds in MPH

48	**V** s0	Stall speed with full flaps
57	**V** s1	Stall speed without flaps
63	**V approach**	**Full Flaps (1.3 x Vs0)**
75	**V approach**	**No Flaps (1.3 x Vs1)**
70 + 2 Notches of Flap	**V** x	Best climb angle
85	**V** y	Best climb rate
115	**V** a	Maneuvering Speed
130 - 162	**V** caution	Yellow Arc
162	**V** ne	Never exceed
A minimum airspeed tow should be done with 2 notches of flaps		
and 65 - 70 MPH.		
Normal tows are done with no flaps and 75 MPH.		

Takeoff

The takeoff roll should begin with some amount of back stick for directional control. Once you have sufficient ground speed go stick forward to lower the nose and get the tailwheel off the ground. **Do Not** takeoff from a 3 point configuration; your airspeed will be too slow and you may settle back onto the runway with side loads on the gear.
Liftoff will occur at about 55 - 60 MPH. You are probably holding too much forward stick if you exceed 60 MPH of groundspeed. Once airborne, accelerate level and then rotate upwards to a nominal climb airspeed of 75 MPH.

Your pre-takeoff checklist should be a cockpit flow that includes these checks:

- Switches (upper left rear)
- Fuel (upper left)
- Carb Heat (middle left)
- Trim (lower left rear)
- Flaps (lower left forward)
- Mixture (panel left)
- Instruments (panel center)
- Primer (panel right)
- Window (right)

Climb

Climb at full power and adjust attitude to maintain tow speed.
Do not allow the glider to overpower the tow plane. This will require, at times, heavy rudder control pressures. This is especially true during tow maneuvers.

When towing gliders that are unfamiliar to you, inquire as to what tow speed they desire.
Glass ships carrying ballast will want a higher than normal tow speed. Unless otherwise stated, assume the flowing:

> Schweizer 1-place ships: Tow speed is ~ 65 MPH

> Glass and 2-place ships: Tow speed is ~ 75 MPH

If you experience a power loss, engine failure, or other emergency after becoming airborne, signal the glider by rocking your wings and transmitting "Rockoff, Rockoff, Rockoff" on the radio. Then maintain safe airspeed and look for a safe place to land. Execute engine restart procedures, if able. If, after the glider has released, you find you still have partial power, use your own judgment as to whether you will be able to return to the gliderport or be forced to land in the first available field.

Immediately after liftoff, consider flying runway track for the first 300 – 400 feet AGL. Do not fly runway heading and allow the tow plane to drift downwind. This is contrary to some popular towing beliefs. We believe that a glider will be in less danger if they accidentally turn downwind after a PTT event. Also, when departing R30, drifting downwind could put you too close to the jump zone.

During climb, you should NEVER FLY TO A POSITION FROM WHICH THE GLIDER CANNOT RETURN TO THE GLIDERPORT. Fly along straight legs, turning only when necessary to keep from getting too far from the gliderport. Turn with bank angles of between 15 and 20 degrees. Steeper banks are hard for students to follow, while shallower banks take too long to make the turn. Students require long straight legs to perform their practice maneuvers.

While towing, the tow pilot does not determine the release point of the glider.
The glider pilot is responsible for determining when to release.

Be aware that pulling the "emergency" release can be dangerous for the glider. The rope can tangle the glider control surfaces. The emergency release is for emergency purposes only.

If spoilers are seen deployed, use discretion when signaling the glider by fanning (wagging) the rudder, use the radio instead. In general, this signal should only be used at a minimum altitude of 1000 feet AGL due to the tendency of glider pilots to mistakenly interpret this as a request for immediate release. If the glider configuration is in question, make a radio call or wait for sufficient altitude prior to fanning the rudder.

Maximum Cylinder Head Temperature can be an issue when towing on hot days. The maximum allowable CHT is 450 °F. If you reach this temperature then you must immediately take corrective action. Reduce power, richen the mixture, or increase tow speed. Check to see if the ground adjustable cowl flap is adjusted to be full open.

Landing

Landings at Byron often require significant attention and decision making. On the weekends we share the pattern with local power pilots and visiting student pilots. We also have a local Sky Diving operation with a jump plane know as "Elevator". For expediency, the jump plane will often takeoff and land in opposite directions regardless of the wind. Although we have the option of performing non-standard patterns, this may not be safe with others flying standard patterns. This is less of an issue with midweek towing when there is less traffic.

Pattern Tows can be a challenge for a tow pilot. This is especially true when the winds are strong and we need to use the same runway as the glider. If winds are lite, it is often best to use the "other" runway. If winds are strong you may want to encourage the glider to release at 1300 AGL so that you can land first. Remember that it takes 25 seconds at 75 MPH to retract the tow rope, a complication that you have that others don't appreciate. Similar complications exist for Rope Breaks. Don't feel bad about using your engine to loiter until the runway is clear.

With its long wingspan and light wing loading, 16Y is a floater. Flying a 1,000 ft pattern just means you will spend more time getting down. Consider an 800 ft pattern relatively close in. Abeam the numbers reduce power to 1300(-) RPM, put in full flaps, and you may still need some slip at some point. The author flys the final at 65 MPH and allows the speed to decay to 60 coming over the numbers.

Weather Considerations

Our most common weather considerations are the winds. Winds are often from the southwest and can get very strong. This will push everybody onto R23 which then gets very busy. Another consideration is density altitude during the summer months. Towing a heavy Grob 103 with 2 adult passengers may require more runway than is comfortable. You may need to abandon the first intersection takeoffs and instead go full length on R30.

END