

## Chapter 5 — Control Configuration

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### 5.0 — Control Configuration Overview

The engine installation requires a throttle and carb heat. Aerocarbs and Ellisons will require mixture control knobs, and they're a good option on Strombergs and MA3s as well. Where these three are located depends on what control stick configuration you have.

#### 5.1 — Carburetor Controls

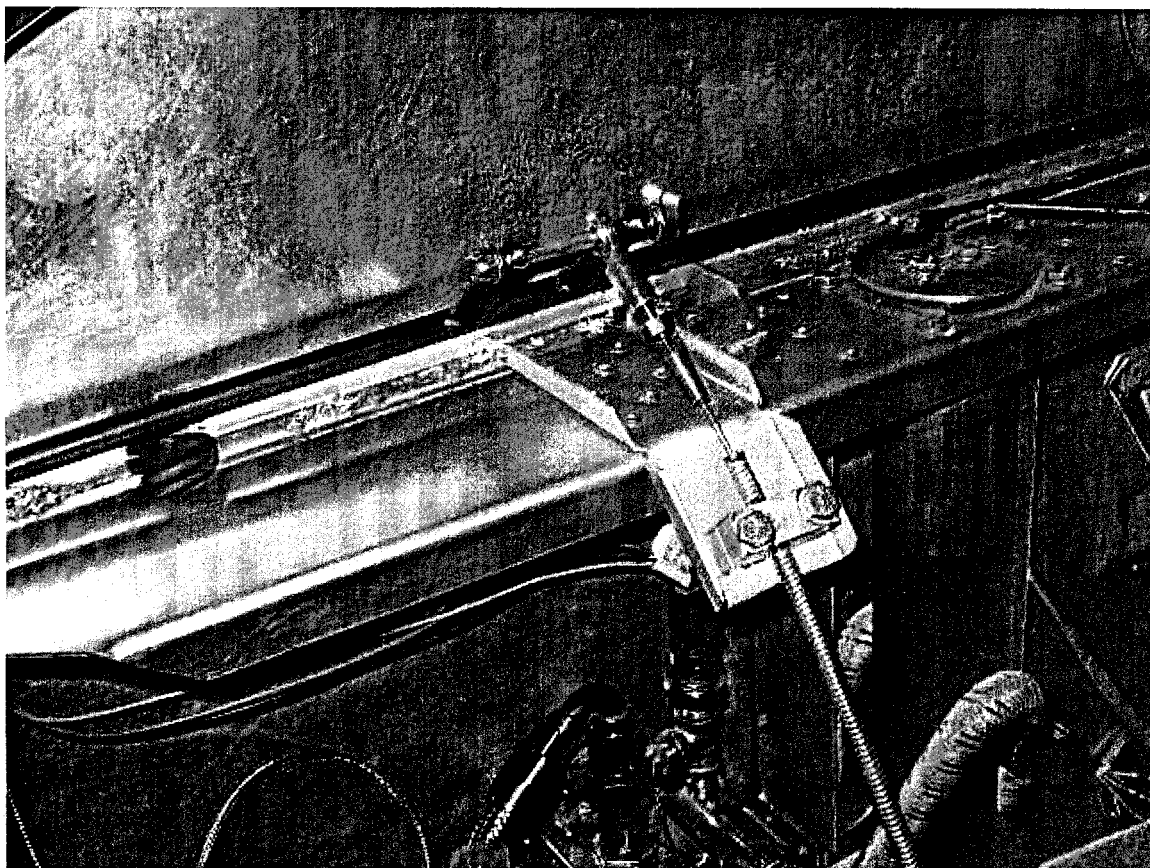
The most common control configuration in 601 series aircraft is the center Y stick with dual outboard throttles. Phil Maxson's N601MX uses this configuration. Our own 601 has the optional dual sticks. It also has outboard dual throttles, primarily because I am more comfortable with the stick in my right hand and the throttle in my left.

A control configuration which may prove to be popular in the future is the one we installed in Rick Lindstrom's quick build 601XL. This aircraft has the dual stick option, but has throttle, mixture and carb heat mounted in a row on the center of the panel. Compared with a dual throttle system, it is far easier to install and rig the carburetor controls with this configuration. It's aesthetically pleasing, and the panel has a clean look.

A fourth configuration is the center Y stick with single pilot carburetor controls on the outboard side. This is also an easy installation, because it utilizes standard throttle cables without the complex linkage necessitated by a dual installation. While this would not be desirable from a flight training standpoint, Roger Davenport, the Zenith factory demo pilot, told me that pilots on their first flight rarely manipulate the throttle. They can get a pretty good feel for the airplane operating the stick and rudders alone. Cleone Markwell's 601HD is set up this way.

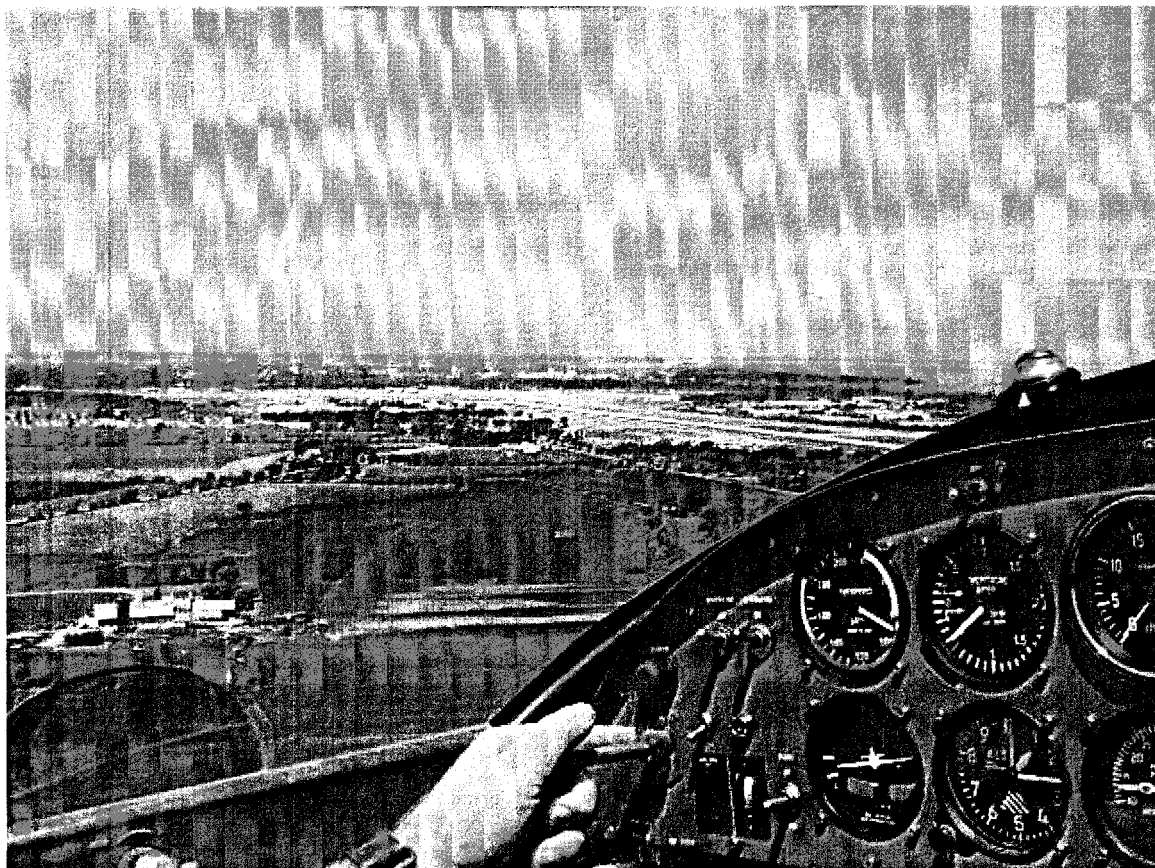
#### 5.2 — Starter Control Options

The starter can be activated by a momentary push button switch or a key switch. In the case of the push button, it's desirable to place it in a position where it can be activated with the index finger of the pilot's throttle hand. This way, his hand does not have to be removed from the stick during start up. Although there's no reason why an engine in a good state of tune and properly set would stall from an idle in the pattern, in the event of this circumstance, you'll certainly want to have the starter at your fingertips. Momentary pushbutton switches capable of handling 20-30 amps are available from SR or BC. This is the setup in N1777W.



**Photo #5/001 — Above is the throttle bracket to mate the ZAC dual throttle shaft to an EFS-3A cable. Top of the fuel system is also visible. Because there are three different throttle positions available and four carb choices, it is difficult to offer a standardized configuration for throttle and mixture brackets. Photos in this Manual illustrate several different configurations that we have built and flown. Chapter 2 includes several views of the bracketry on the carb. The carb heat cable is connected to the arm on the air inlet scoop, part of the lower cowl.**

Some pilots will choose to use an automotive key switch with a turn to start position. The key should be placed in a convenient to reach position. 12 volt power to the coils and fuel pumps can be run through this switch. However, if this is done, special consideration should be given to the placement of the switch so it will not be bumped to the off position by reaching for a radio knob, etc. In operation, only the key for the airplane should hang from the switch. Other keys on a ring or a large fob are an invitation to bump off the switch at low altitude. If the key is not extremely secure in the switch, having it on a lanyard makes sense. Phil Maxson's 601XL N601MX is wired this way.



**Photo #5/002 — N1777W on base to arrive at AirVenture Oshkosh 2004. Starter button is right above the throttle. Ignition A/B DPDT switch is directly above VSI.**

### **5.3A — DPDT Switch, XL Models**

The DPDT switch is wired to provide simultaneous power to one coil and one fuel pump at a time. The other side of the switch provides power to the other coil and other fuel pump. N1777W has a center off position on the switch. N601MX was wired with an automotive key switch to interrupt the power coming into the switch. Its DPDT switch has no center off position. The diagram of this is in Chapter 4.

The switch should be mounted high on the panel, away from other controls, directly in the pilot's line of sight. This is even more important if the switch has a center off position. You must use a mill spec MS snap action switch intended for use in aircraft. These are emblazoned with MS right on them and let off a resounding click when moved to a different position. In practice, an average pilot can take his hand off the throttle and snap the switch in less than a second. When overworked, the points based ignition and style of fuel pumps we use tend to fail by letting out a little hiccup or slight reduction in rpm. They're not known to fail instantaneously. Even in the unlikely event of a sudden and complete failure, almost all pilots would be able to move the switch to the other position before the propeller stopped windmilling. All of this is emergency procedure to be practiced for. We've never had an ignition system or fuel pump failure on our 601.

*This switch is an excellent example of how our work realistically addresses the needs and capabilities of our customer base. Most 601 builders are low- to mid-time pilots who aim to successfully build and fly a capable yet simple machine. In line with this, we sought an electrical layout that would allow amateur pilots to operate the system with the minimum amount of risk in the event of trouble.*

*Ask any multi-engine instructor, and he'll tell you that after a simulated engine failure in training, a very high percentage of amateur multi-engine pilots accidentally pull back the power on the remaining good engine. In a suddenly stressful situation, diagnosing the problem is a difficult challenge.*

*The DPDT switch allows the amateur pilot to bring online a fresh fuel pump and a new ignition instantly without having to diagnose what the problem is and which switch to throw to solve it. While we all like to think of ourselves as fighter jocks sometimes, it's important that the design of the electrical system reflects that in reality the vast majority of builders are amateur pilots.*

After great consideration, the final configuration of our 601's ignition and fuel pump power circuit runs through a double poled, on-off-on, double throw switch, Stock No. S700-2-1 (BC) at the top of the panel, directly in front of the pilot, away from all other knobs and switches. Our aircraft has no key switch.

The DPDT switch on our plane has a center off position. One side of the switch provides power to one coil and the primary fuel pump. Flipping the switch to the other side provides power to the second coil and the backup fuel pump. Although the plane was originally wired with separate switches for ignition and fuel pump, I converted it to the DPDT system after considering human factors in the real world environment. If the engine stumbled, the original configuration required the pilot to look at the instrumentation and decide whether he was experiencing a fuel or ignition issue. If startled at low altitude, it is optimistic to think that an amateur pilot will do this correctly and quickly, ensuring that multiple switches are in the correct position. The DPDT system, conversely, only requires the pilot to throw the switch as an instant response without diagnoses in the event of engine roughness.

### **5.3B — SPDT Switch, HD and HDS Models**

Gravity feed systems can use a single pole double throw switch to the same effect as a DPDT switch. The HD and HDS models with gravity feed header tanks in the fuselage do not need continuous duty fuel pumps ahead of the firewall. If they're equipped with wing tanks feeding the header tank, they will use the factory supplied intermittent use fuel pumps to transfer the fuel from the wings to the header. These aircraft use a single pole, double throw switch in place of the double pole, double throw switch of the XL model.

On the HD and HDS models, the switch will merely select A or B ignition. The requirement for the switch to be MS, snap action, aircraft grade, and the option for center off or key switch remains the same as the DPDT models.