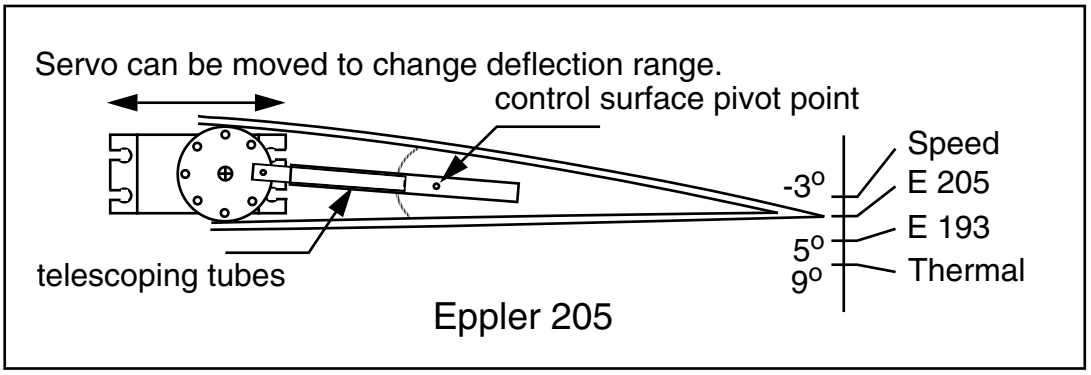
A Novel Control System Mechanism

An unconventional model from Holland provides an idea for enthusiasts of tailless planforms...

We often receive inquiries about trimmable control surfaces. In addition to the standard aileron and elevator or elevon complement, the designer may wish to have a "trim tab," as this can be quite handy when trimming a tailless sailplane for best performance within a specific flight regime. Until this idea appeared in DELTA, however, every mechanical system we had seen had two problems; drag from various mechanical components protruding into the airstream, and "system slop."

In order for the servo to transmit its relatively large forces to the control surface for appropriate deflection, some sort of mechanism must be designed and built which will provide the needed control surface deflection range and an appropriate mechanical advantage. The most obvious way of accomplishing this is to put a rather large arm on the control surface, and attach a smaller than usual servo wheel to the servo. But a long control horn is anti-aesthetic, produces a large amount of drag, and disrupts the local airflow over the control surface. We have found such control systems also lack rigidity.

The control system sketched here, however, has some real advantages. There is nothing protruding from the wing or control surface, so it is aerodynamically clean, and there is a minimum of slop in the physical system. Additionally, a standard servo wheel can usually be used. This system consists of a set of telescoping tubes which are attached at one end to the control surface and at the other to the servo wheel.



The diagram shows the component layout used within the wings of *Onnozel*, a "noseless" V-tailed sailplane designed for F3B. As you can see, the range of deflection for camber changing is just 12^{o} — three degrees up and nine degrees down — but the total range of deflection is greater. The control surface can be moved in very small increments while being held rigidly in position at all times.

Readers implementing this control system should begin by either drawing the system geometry on paper or by building a mock-up which allows adjustment of servo position. Less control surface travel, and finer adjustment, can be obtained by moving the servo further away from the control surface pivot point, while more travel can be realized by moving the servo closer. Since the entire mechanism must fit inside the local internal height of the wing, a bit of experimentation is certainly in order.

We would very much appreciate hearing from any readers who utilize this idea in a tailless sailplane.