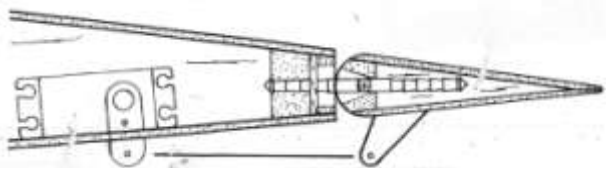
The Spangenberg Aileron Linkage

--by David Andersen, www.mnbigbirds.com

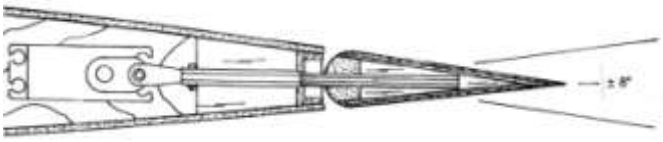
Chris Spangenberg introduced this novel aileron control linkage in his column in *High Flight* Magazine. It has the following advantages over the conventional pushrod linkage:

--No exposed non-scale parts,
--High mechanical advantage,
--Tight control, the only play is in the servo,
--Play does not increase with use due to large wearing surfaces,
--Smooth precise control,
--Easily removable ailerons,
--Simple construction.

Its major disadvantage is control throw is limited by the thickness of the wing. Throw is typically no more than about ±8°. It cannot be used in very thin wings or aircraft with small ailerons or extremely aerobatic aircraft. Also, the wing must be thick enough to contain the aileron servo and its horn. A minor disadvantage is that its neutral position and differential cannot be adjusted mechanically but this is generally not necessary with modern radios.



Conventional pushrod linkage



Spangenberg brass tube linkage

The Spangenberg linkage is most suitable for large warbirds and other large scale semi-aerobatic aircraft where smooth, precise control and scale appearance is preferred to extreme maneuverability.

The system consists of two concentric brass tubes and a ball link. The smaller 3/16" brass tube is permanently epoxied to the aileron while the 7/32" brass tube is attached to the servo's control horn with the ball link. The shaft of the ball link is epoxied into the brass tube and secured with a 2-56 x 3/8" bolt and nut. The brass tubes slide within each other as the aileron moves. The large contact surface area provides a long life and very little play. No lubricant is needed. Do not substitute aluminum tubes—they are not strong enough.

Aileron hinging is conventional, typically Robart Hinge Points. Install a hinge close to the Spangenberg linkage to minimize bending of the aileron while under stress.

If Robart Hinge Sockets are used, the aileron is easily removable.

To see a demonstration of the Spangenberg system, go to www.mnbigbirds.com, click on Andersen Designs and click on Mitsubishi Babs flight video. Note the smooth, precise roll control. The slow roll in the video was done with less than 1/4th full deflection. Still smooth after hundreds of flights.

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