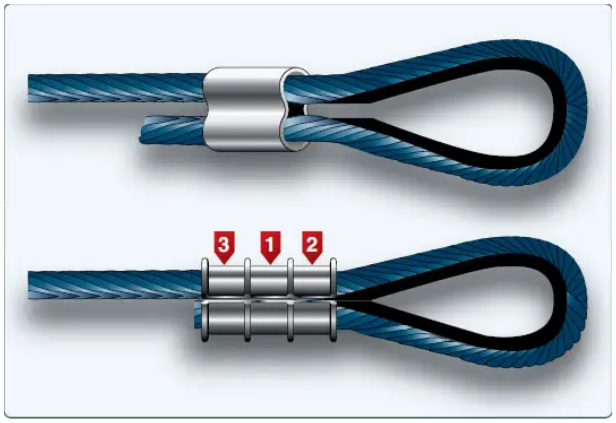
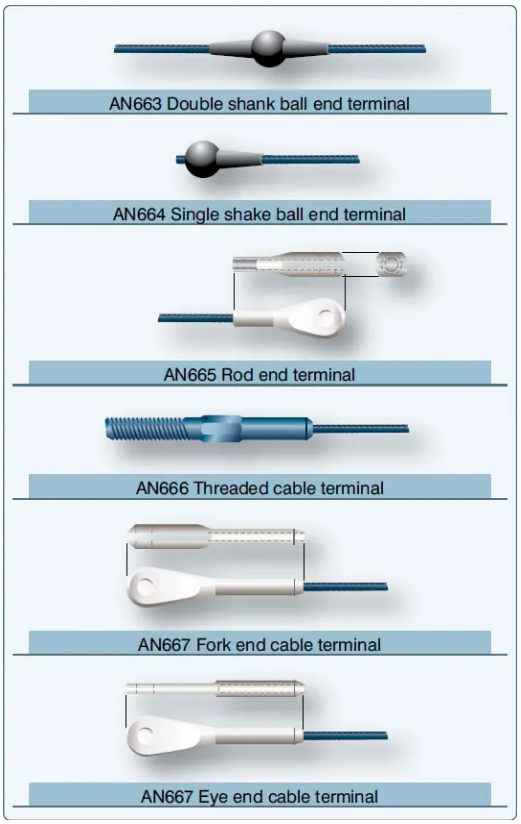
Cable Research

Nicopress vs Swage-type terminal fitting





Swagging Info from the Affordaplane (pg 51)

“Slide a nicopress copper sleeve onto the cable you are going to swage, insert the thimble, slide through the cable tang, and loop it back through the nicopress sleeve. Make sure the loop is snug and tight as you can make it, and then clamp both wires”

“Make sure the loop is snug and tight as you can make it, and then clamp both wires together right behind the nicopress sleeve using a pair of small vice grips. Swage the nicopress sleeve in place. Make sure you use your go/no-go gauge after swaging. These wires take the sway loads of the gear, and help stabilize the wing attach tube above. Now you have one end swaged in place, and the other end of the cable free”

Note: Uses clevises, Have to swage it

Cable Hook up + Pulleys

Name	Purpose
Stainless steel cable tang ¼ inch holes	
Stainless steel cable tang 3/16 inch holes	^^^^ may need 3/16 but need to check forces first
Cable thimble AN100-4	Thing that rounds it out - need almost 100 of these
Stainless steel aircraft cable 3/32” diam. 7 X 19 galvanized cable strand 150 feet	1/ 8 Used on the piper cub - Really good material should get this one For the actual cable material MUST USE TIN SWAGES FOR STEEL CABLES
Nicopress sleeve 18-2-6	- https://bearhawk.wpengine.com/wp-content/uploads/2015/12/BHManual-fuselage26-45Rev2.pdf - Everywhere cables run in the airplane they are terminated with some version of Nicopressed connection. - your life depends on the quality of the Nicopress installation - if they slip, you’re going to lose control of that portion of the airplane On how to install: Bingelis books AC 43.13 MUST USE TIN
AN/MS Pulley #MS24566-2B 3/16 inch hole	Pulley but need a cover for it as well
MS20392-2C19 clevis pin	If we want to go the not-nicopress way

	A Word About the Tail Strut Clevis  *Tail strut clevis fork needs washers to keep from crushing it. This is also an excellent example of why you paint all the parts separately, rather than when assembled. Painting hard - ware always results in flaking paint.*
MS20392-2C11 clevis pin	If we want to go the not-nicopress way
AN115 shackle	To connect tanged cable to lever thing, attached with a 3/16" bolt http://mybearhawk.com/fuselage/bellcrank3.html 
Rod end, female. ¼ inch I.D. hole, ¼ -28 thread	Clevis with a bearing at the end- if need for rotating parts
Cable Guard	All cables should have cable guards on the pulleys to keep the cables in place.

Cable guards should be made of .062 steel and fit over the pully with a minimum of clearance. Their purpose to to keep the pully from climbing over the edge of the pully groove.

Some pully guards benefit from having an extended lege that is secured to a stationary surface to keep them from rotating with the pulley or cable. This is the aileron pully in the wings

Cable diameter vs Strength:

				MINIMUM BREAKING STRENGTH (Pounds)		
NOMINAL DIAMETER OF WIRE ROPE CABLE	CONSTRUCTION	TOLERANCE ON DIAMETER (PLUS ONLY)	ALLOWABLE INCREASE OF DIAMETER AT CUT END	MIL-W-83420 COMP A	MIL-W-83420 COMP B (CRES)	MIL-C-18375 (CRES)
INCHES		INCHES	INCHES	LBS	LBS	LBS
1/32	3 x 7	0.006	0.006	110	110	
3/64	7 x 7	0.008	0.008	270	270	
1/16	7 x 7	0.010	0.009	480	480	360
1/16	7 x 19	0.010	0.009	480	480	
3/32	7 x 7	0.012	0.010	920	920	700
3/32	7 x 19	0.012	0.010	1,000	920	
1/8	7 x 19	0.014	0.011	2,000	1,760	1,300
5/32	7 x 19	0.016	0.017	2,800	2,400	2,000
3/16	7 x 19	0.018	0.019	4,200	3,700	2,900
7/32	7 x 19	0.018	0.020	5,600	5,000	3,800
1/4	7 x 19	0.018	0.021	7,000	6,400	4,900
9/32	7 x 19	0.020	0.023	8,000	7,800	6,100
5/16	7 x 19	0.022	0.024	9,800	9,000	7,600
11/32	7 x 19	0.024	0.025	12,500		
3/8	7 x 19	0.026	0.027	14,400	12,000	11,000
7/16	6 x 19 IWRC	0.030	0.030	17,600	16,300	14,900
1/2	6 x 19 IWRC	0.033	0.033	22,800	22,800	19,300
9/16	6 x 19 IWRC	0.036	0.036	28,500	28,500	24,300
5/8	6 x 19 IWRC	0.039	0.039	35,000	35,000	30,100
3/4	6 x 19 IWRC	0.045	0.045	49,600	49,600	42,900
7/8	6 x 19 IWRC	0.048	0.048	66,500	66,500	58,000
1	6 x 19 IWRC	0.050	0.050	85,400	85,400	75,200
1 - 1/8	6 x 19 IWRC	0.054	0.054	106,400	106,400	
1 - 1/4	6 x 19 IWRC	0.057	0.057	129,400	129,400	
1 - 3/8	6 x 19 IWRC	0.060	0.060	153,600	153,600	
1 - 1/2	6 x 19 IWRC	0.062	0.062	180,500	180,500	

Cable Directing:

- fairleads are a hard plastic ring mounted in a piece of 7/8" x .058 tube cut to 1/2" long

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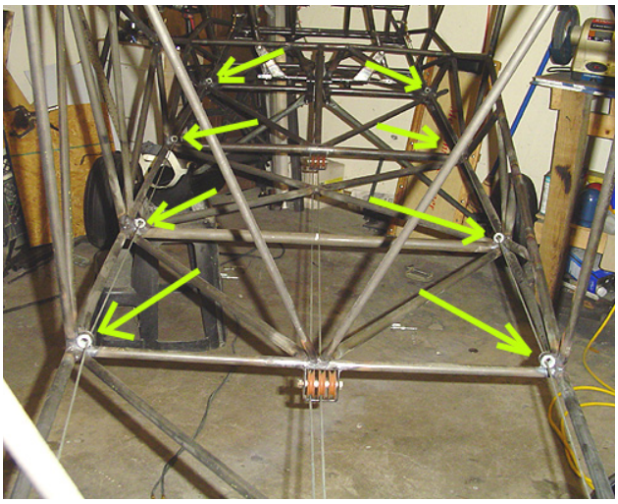
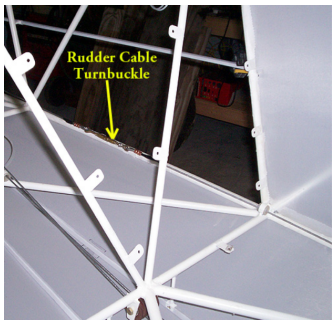
    - http://mybearhawk.com/fuselage/pedals4.html
- 
    - http://mybearhawk.com/fuselage/pedals5.html
- “nylon/plastic standoff fasteners for routing the cable via brass fairleads fore and aft of the rear strut”

Rudder info

Words Directly from the Affordaplane Build Manual

“To make the rudder cables, make up two lengths of 3/32” aircraft cable, that extend beyond the fuselage tail post about a foot. Nicopress each wire to the corresponding hole in the top of each pedal. leaving the ends free for now. Coil up and secure with electrical tape, and place inside the cockpit”

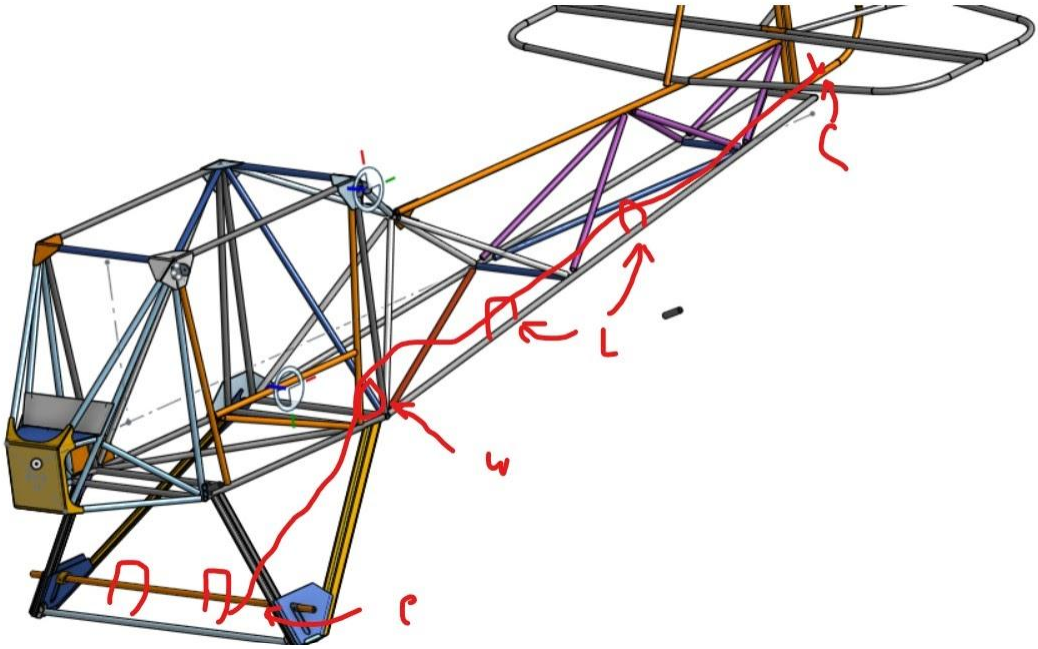
Note: This guy doesn't like turnbuckles for the rudder cable near the pedals because he things it'll get caught on him

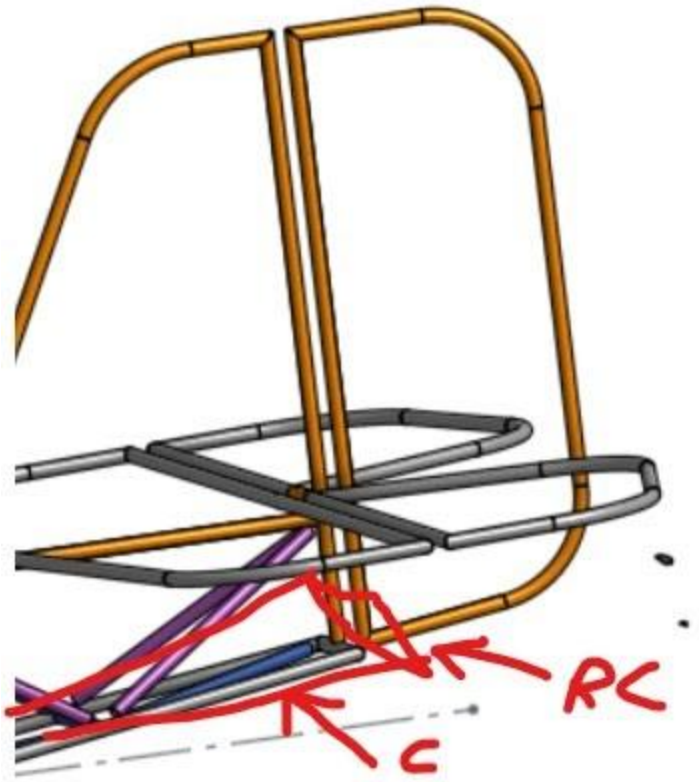
Old 

New: 

Old Rudder Attachment Design:

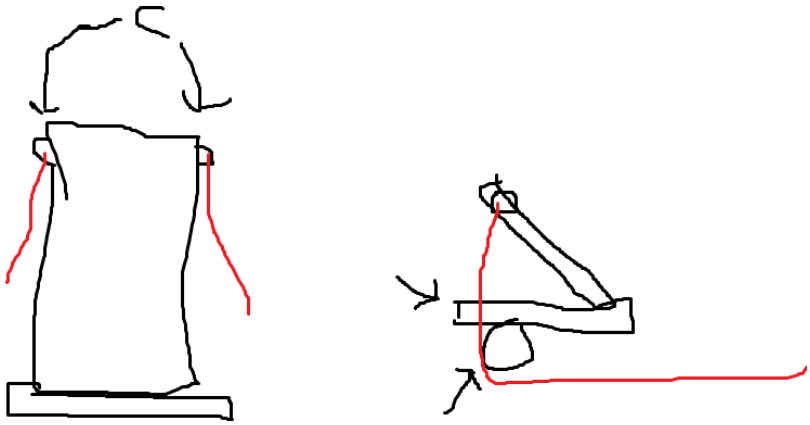
Possible rudder connection Idea - p = pedals, w = pulley to increase tension and route cables, l = connection loops to hold cables to tail design, c = connection device (have concept ideas will get back to that)

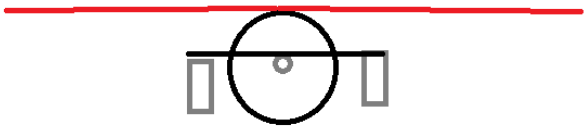




Red = cables, arrows on right point to pulleys and base (Below and above respectively), c = caple holes ***requires cables to switch sides on end to allow correct orientation

Pressing each pedal releases tension from one side allowing other to be pulled due to extra tension





Process for Attachment

Affordaplane notes: pg 51

- NOTE: You will want to have the aircraft covered with fabric before you attach any
- cables.
- Rudder: need cable guides
- Then add the nicopress
    - Don’t swage yet- just hold in place with cable clamps
- No slop- nice and tight
- Rudder must be centered and held in place
- Add th springs to the tailwheel bellcrank and swage the two cables to the springs- one on each side 
    - This is what the affordaplane does and it’s honestly not even jank
- Make a Y attachment from the rudder cables to tail wheel
    - Take the end of the ends of the cables from the tailwheel

Note: After trimming cable : should have ½” sticking out

Directions from 7-148 Mechanically-Fabricated Cable Assemblies

a. Swage type terminals:
    i. Safe up to max cable loads
    ii. Must follow all manufacturer's instructions
        1. Including "go, no-go" instructions
    iii. Terminals
        1. Cut the cable to the proper length allowing for growth during swaging
        2. Apply a perspective compound to the cable end before insertion into the terminal barrel
        3. Never soldier cables end to prevent fraying
            a. Soldering will make the cable pull out
        4. Insert the cable
            a. into the terminal approx 1 in
            b. Bend toward terminal barrel
                i. Bending action puts a bunk or bend in the cable end
                ii. Provides enough friction to hold the terminal in place using the swaging operation can be performed

TABLE 7-5. Straight-shank terminal dimensions. (Cross reference AN to MS: AN-666 to MS 21259, AN-667 to MS 20667, AN-668 to MS 20668, AN-669 to MS 21260.)

		Before swaging				After swaging	
Cable size (inches)	Wire strands	Outside diameter	Bore diameter	Bore length	Swaging length	Minimum breaking strength (pounds)	Shank diameter *
1/16	7 x 7	0.160	0.078	1.042	0.969	480	0.138
3/32	7 x 7	.218	.109	1.261	1.188	920	.190
1/8	7 x 19	.250	.141	1.511	1.438	2,000	.219
5/32	7 x 19	.297	.172	1.761	1.688	2,800	.250
3/16	7 x 19	.359	.203	2.011	1.938	4,200	.313
7/32	7 x 19	.427	.234	2.261	2.188	5,600	.375
1/4	7 x 19	.494	.265	2.511	2.438	7,000	.438
9/32	7 x 19	.563	.297	2.761	2.688	8,000	.500
5/16	7 x 19	.635	.328	3.011	2.938	9,800	.563
3/8	7 x 19	.703	.390	3.510	3.438	14,400	.625
*Use gauges in kit for checking diameters.							

NOTE: If the terminal is drilled completely through, push the cable into the terminal until it reaches the approximate position shown in figure 7-10. If the hole is not drilled through, insert the cable until the end rests against the bottom of the hole