

# SKYBOLT NEWS

910 S. HoHoKam DR. BLDG. 107  
TEMPE, ARIZ. 85281  
602-968-2556

Copyright 1982 H.G.McKenzie  
All rights reserved



SERIES #4, VOL. #6

## HANGAR FLYING with MAC

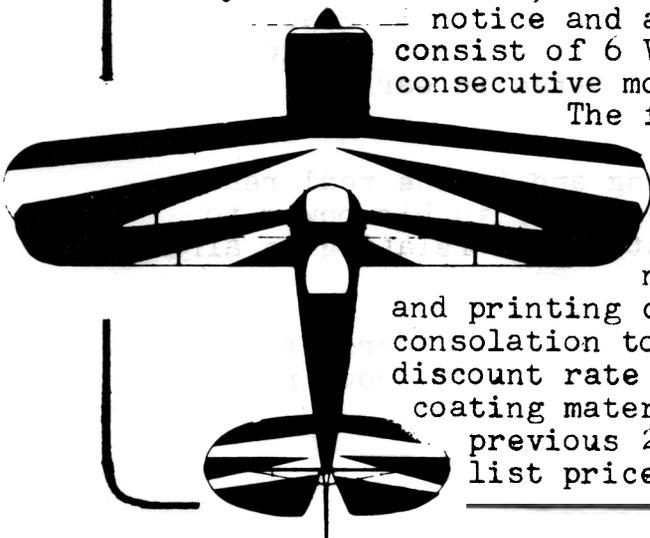


I'm really apprehensive about mailing this last Volume of Series #4 for fear that many of our subscribers will succumb from shock and I'll be left to face the wrath and law suits of their heirs. But, God hates a coward so I'll forge ahead in hopes that the previous graciousness of our readers still prevails.

Before getting on to the meat of this issue, the full sliding dual canopy, I want to address the issue of continuing the Skybolt News. So far, we have a raft of new improvements and ideas to further enhance the quality of the Skybolt. Much has been gained from our prototype program regarding the Firebolt. More about the Firebolt in later issues of Series #5. At the moment, the Firebolt is in the capable hands of Guy E. Moman, Jr. of Tuscaloosa, Alabama and well on it's way towards completion.

For your convenience, we have inserted a subscription re-newal notice and a stamped envelope. Series #5 will consist of 6 Volumes and be mailed to you on a consecutive monthly basis via "First Class" mail.

The full price for U.S. subscribers is \$20. The price to all foreign subscribers, including Canada, is \$25 in United States Funds. I regret the increase in price but it is necessitated by the increase in mail and printing costs. However, it will be of some consolation to our U.S. subscribers to know the discount rate on Stits Poly-Fiber covering and coating materials has been increased from the previous 20% to the new discount of 25% off list prices. Further, our U.S. subscribers are



eligible for a discount of 15% off list prices on Lycoming engines (New Only) and Macwhyte Wires. A 20% discount is offered on most Hartzell and Sensenich Props.

When sending in your subscription re-newals for Series #5, please Make Your Checks Payable to "H.G.McKENZIE".

SKYBOLT NEWS, SERIES #1,2,3 and 4 (Complete series and back issues

All previous Series (complete) and separate issues are available. Due to the limited requests, most back issues and complete Series have been Xerox copied resulting in a higher price. Complete Series are available for \$20 per Series and \$5 for single issues.

Also, did you know that the "Skybolt News" has become a most valuable sales aid when selling your project or completed aircraft? Yes indeed, the mere mention that your Skybolt was built to Skybolt News specs or has many components purchased from Starfire Aviation will go a long way in assuring prospective buyers that yours is a quality project. Poor craftsmanship however, can only be sold by lying and innuendo.

#### SKYBOLT TAIL GROUP "FLUTTER"

On 10 Dec. 1981, I received a phone call from a builder in Canada who had just test flown his Skybolt and with just over one hour of flying time, had encountered severe Tail Flutter. In fact the flutter was so severe, that it nearly cracked the righthand upper longeron in two at a point just forward of the rear horizontal stabilizer connector tube.

Some of the specifics of construction are as follows. Engine Lycoming 540 Series 260 hp. Elev. trim system consisted of a cable operated 10" tab on the righthand elevator and a plain servo 10" tab on the lefthand elevator. Dynamic balance tips were built on the elevators, but, no lead had been installed in the tips to provide any static balance of the elevator mass. MS20257 Piano Hinge was used for mounting the trim tabs. The builder was not a Skybolt News subscriber and therefore un-aware of the tail group and trim system information I have covered in earlier issues of the Skybolt News.

Flutter can be an insidious thing and is the real reason a prudent craftsman must do everything in his power to employ proven practices of construction relating to airfoils and control surfaces.

I have previously written about cases of Aileron Flutter that occurred at 125 m.p.h. with near disastrous results.

In the case of our brother "Bolt" builder, his Tail Flutter happened at 160 m.p.h.

At this time in our discussion of Flutter, lets go back to some basic facts relating to the problem. In general, Flutter can be induced by any of the following factors.

- A. Engine vibration and or prop vibration
- B. Aerodynamic buffeting or turbulence
- C. Any combination of the above

In piston powered aircraft, I'm a firm believer in the last category "C". Further, it's a proven fact that excessive play in the hinges of a control surface or trim tab can and in many cases will lead to Flutter. It is part of your everyday, every flight, preflight responsibility to check for excessive play in the control system.

Are you as a builder, aware of the maximum free play allowed in a control surface or trim tab as measured vertically at the trailing edge? The old CAA Manual 18 states it very plainly. The looseness or free play shall not exceed 2% of the chord, of any control surface or trim tab, measured vertically at the trailing edge in thousandths of an inch. As an example, 2% of 1 inch equals .020 If a trim tab has a 4 inch chord, the maximum allowable free play will be .080 inches. I once inspected a homebuilt Pitts for a friend who was about to purchase same and found, with the control stick held in a rigid position, almost 2 inches of free play in the elevators. This same aircraft had been used by the owner in airshows. The old adage sure holds true. "Every custombuilder has to a large degree, full control of his destiny.....Fate merely goes along for the ride."

Exactly what caused our Canadian friends Flutter problem is not certain. I hesitate to try to pin point the cause but have advised him that there are three areas in his construction that may be the culprit.

1. Improper cable tension in the trim tab control system. (Too tight or too loose)
2. Lack of balancing weight in the dynamic balance tips of the elevator. (Balancing the tips with lead will do two things. It will make the elevators lighter on the stick pressure and change the harmonic resonance frequency of the elevator assembly.
3. Excessive play in the trim tab or the servo tab.

From instinct I will venture a guess that item #2 above is the problem.

Well! here it is New Years Day '82 and I have the typewriter in the den pecking away at this long awaited issue of the Skybolt News. The TV is tuned in to the Fiesta Bowl game and the Nittany Lions of Penn State are wailing hell out of the Trojans of USC ( early in the third quarter). The intensity of both teams is so vivid that both quarterbacks are throwing the ball in situations under which they are being intercepted. If they could only see the forest but for the trees, most of these bad passes most likely would not have been thrown. I can't help but being reminded of the same kind of intensity that invades the homebuilders realm of influence. So intent on craftsmanship to the best of their ability that they sometimes can't see the forest. Read on McDuff.....

Call it coincidence, call it whatever you like, yesterday afternoon I inspected a brand new 330 hp. well built, highly modified Skybolt and guess what ? The lefthand combination Servo Trim Tab had over .125 loose play at the trailing edge. Luckily nothing has happened and this Bolt has been Flutter tested to 220 m.p.h. so the builder claims. One thing is for sure, at the speeds at which this craft flies, that loose tab can, at some unsuspecting moment, make a statistic out of this beautiful aircraft in a matter of seconds. If you don't believe me, corner Buzz Lynch the Chief experimental Test pilot for Fairchild - Republic and ask him about the experience of one Test Pilot in a new jet with twin booms and a horizontal stabilizer made out of a milled piece of solid aluminum 8" thick and 14" wide x the full span between the booms. This aircraft literally exploded in 2 seconds when Flutter occurred. You'll probably meet Buzz one of these days when he flies his Skybolt to Oshkosh. The Dual Canopy photos that you see on the following pages are of Buzz's Skybolt on which I finished the installation and he picked up the day before Thanksgiving for it's trip back home to Redlands, Calif.

#### INSTALLING THE DUAL CANOPY ( Part 1 )

Way back in 1978, Series 3, Vol.#6 Page 11 to be exact, I wrote an article in which I stated that the decision to install a Canopy comes "with either 50 hours or 50 degrees F., whichever comes first".

It seems that I have literally spent a lifetime of inspecting and researching canopies in search of the ideal for our type of aircraft. That lifetime has actually been 10 years. The results of that search is contained in the following pages and represents approx. 300 hours of design

time and 300 hours of construction time on the Firebolt prototype and it still wasn't finished when I delivered same to Buddy Moman of Tuscaloosa, Ala. He will finish installing the coaming, skirting, quick release system and locking mechanism. Since I have been able to achieve most of my objectives, The Firebolt name was changed to "The FIREBOLT CONVERTIBLE". The objectives of my design are as follows.

**Safety:** The canopy assembly had to have a "Quick Release" system so it could be jettisoned in the air if required as well as for maintenance on the ground. Most of the homebuilt canopy designs that I have seen are sadly lacking in the safety department. The most widely used design by Skybolt builders has been the 2 piece full canopy that operates as follows. 1. Slide the rear section aft. 2. Slide the middle section aft and allow the front seat passenger to enter the aircraft. 3. Slide the middle section forward and allow the pilot to climb in. 4. Slide the rear section forward and lock same. To exit the aircraft, you must reverse the procedure. While the Pitts type canopy comes closest to my objectives ( I'm not in favor of the slide back tilt open type ) and does have a "Quick Release" a couple of them have been blown off on the ground by jet blasts. These have been rare cases and not a cause for alarm. The incidents could have been avoided if the owners or pilots had'nt taxied into jet blasts with the canopy unlocked. One of the latest of biplanes that was copied after the Pitts did not have a quick release on the canopy during the early part of their program but have added one since that time.

**Low Drag:** Our design had to have the lowest possible drag consistant with that design. To achieve this, meant flush fairings and mounting. I think that the photos will attest to the fact that we have reached that objective to a large degree.

**Versatility:** While we are at it, how about a design that allows us to slide the canopy straight back, thereby un-covering both seats but also has a controllable locking mechanism that lets us lock the canopy in several travel positions. To satisfy the "Wind in your face types" who hangar their craft during the cold weather, lets design the canopy frame mounting so that we can change from closed cockpit to open cockpit flying in less than 15 minutes, by building

a dummy coaming and windshield assembly that we simply set on the locating pins and safety with safety pins. How about a canopy system that can be opened 1 or 2 inches to allow ventilation on a hot day and yet the aircraft is still fully secured allowing no one to enter the aircraft except the owner. To further enhance the versatility of the design, we'll include a simple "Locking Indicator" so that a mere glance will tell us if we are ready to terrorize the skies.

**Esthetics:** The canopy must have beautiful lines and those lines must blend into the slope of the turtle-deck. From any quadrant, the lines must be pleasing to the eye.

**Seals:** Our design must take into consideration the proper sealing against water leakage and air leakage. The seals must be something off the "proverbial shelf".

**Ventilation:** There must be some method devised to allow airflow and exhaust of same, Heating and Air Conditioning if you please, plus the relief of internal pressure. In the ensuing issues, we will show you how to install a sliding louver control on the rear fairing at the pilots position.

**Weight and Strength:** Our design is a little on the heavy side, weighing in at 25 pounds including tracks, frames, fairings, control mech. etc. The weight penalty is more than offset by an expected increase in cruise speed of at least 10 m.p.h. plus the added comfort. In the future, I expect to be able to decrease the weight approx. 8 lbs. At the moment, it is "Hell For Stout" and figures to with stand a pull test of 500 lbs. minimum. Why so strong you ask? The answer is that a clean aerodynamic canopy has high lift forces acting on it especially when you consider that some of our higher powered Firebolts and Skybolts and the like, are easily capable of speeds well in excess of 200 m.p.h. Another strength factor to consider on some aircraft designs is that of an impact with a bird. I have discounted this factor however, since in our case we are well protected by a prop disc and the design of the cabane structure which leaves little chance that a bird would be able to impact with our "Glass House". In a design like the Varieze, the Imp or other pushers, the bird factor is of much more importance.

All in all, I think that we have achieved or exceeded our objectives in good shape.

Dis-advantages: There are always a few. (A) Our canopy cannot be installed on existing, flying Skybolts without an awful lot of work, due to the welding necessary on the airframe to install the track mounting brackets and front formers. (B) Due to the cabane strut design, the front cockpit opening is on the small side because it is impossible to mount the windshield as far forward as we would like. But alas, even the open cockpit version (standard Skybolt) is very tight.

"IT'S TIME TO GET ON WITH THE SHOW"

In photo #1 we see the full installation on Buzz Lynch's Skybolt. No fiberglass fairings were used. All fairings are made of aluminum and the windshield frame is hand formed ( I made 2 before I was satisfied ). The rear fairing locks in place as the canopy slides to the closed position. Photo #2 is more of a 3/4 view. The aircraft in the background is a Skybolt that we will have at OSHKOSH '82

# 1

788 3



# 2.

6-788-2



Photo #3 is a shot of the "Firebolt Convertible" taken on the front lawn of Buddy and Anne Moman's beautiful home in Tuscaloosa, Al. Of special note is the windshield mounting bracket that welds to the top longeron. The fairings are all temporary. Some other special notes are (A) extra fuselage formers are used to stop the fabric at the rear seat, (B) the coaming, sidewall and belly formers forward of the front seat back are radiused over the longerons, (C) a compression strut has been added to the cabane strut bushings.

In Photo #4 we see a frontal view of the Firebolt

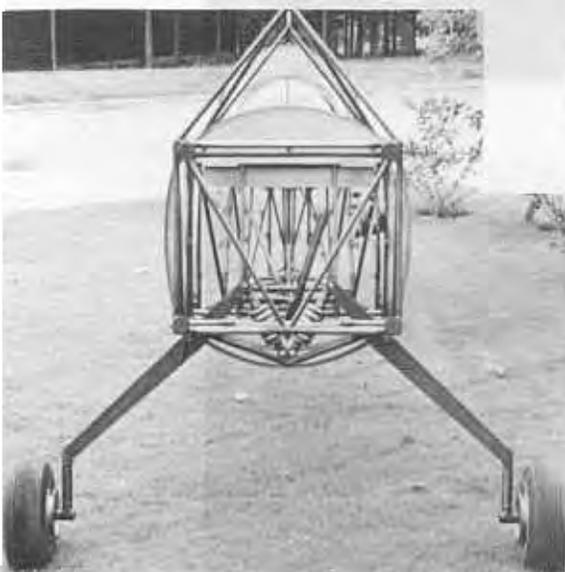
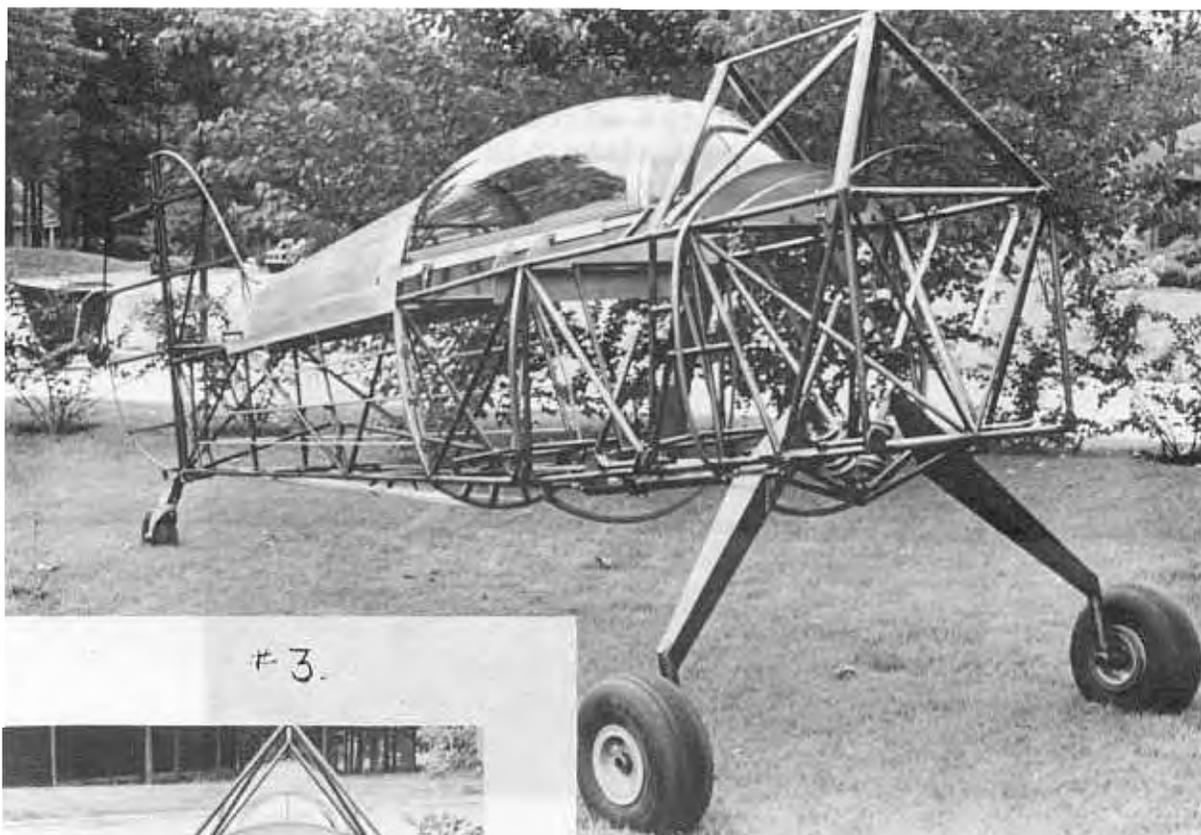


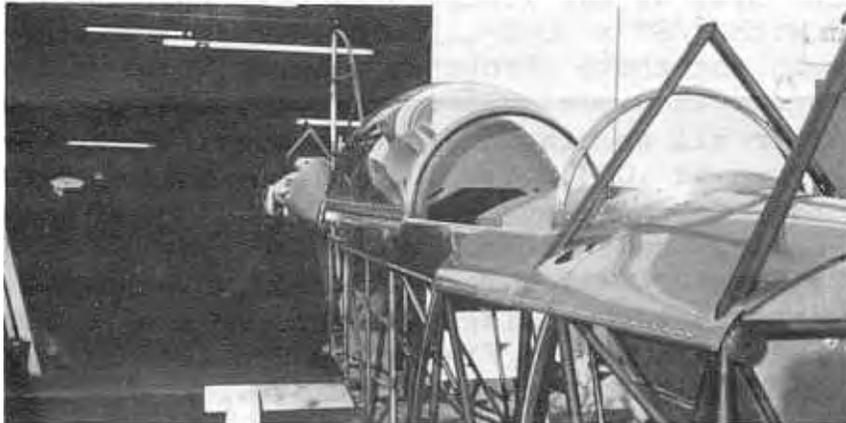
Photo #5 is a direct rear view of the Skybolt showing the canopy lines blended into the coaming with no bulges or external tracks.

Photo #6 shows a frontal 3/4 view of the canopy in it's rearward position. The front bow is not quite back to the headrest but it will be after we remove the canopy for further fuselage construction. Please note the rear instrument panel and front seatback bulkhead with it's aluminum cover between the two which is strong enough to sit on, making entry to the front seat much easier.

Photo #7 shows a 3/4 view from the rear. Visible in this shot is the secret to the entire design, the triple, telescoping, ball bearing tracks. On the Skybolt we only need approx. 48" of travel, but this track will allow up to 55½" inches of travel. Fully telescoped in their closed position, the tracks measure only 40" but are never used in this position. At Starfire Aviation, Inc. we have the tracks manufactured specially for us. Even in quantities of 50, they are expensive, but like all quality products that do a professional job, they're worth every penny. As of this date 1-1-82 they are \$325 per pair and are in stock.

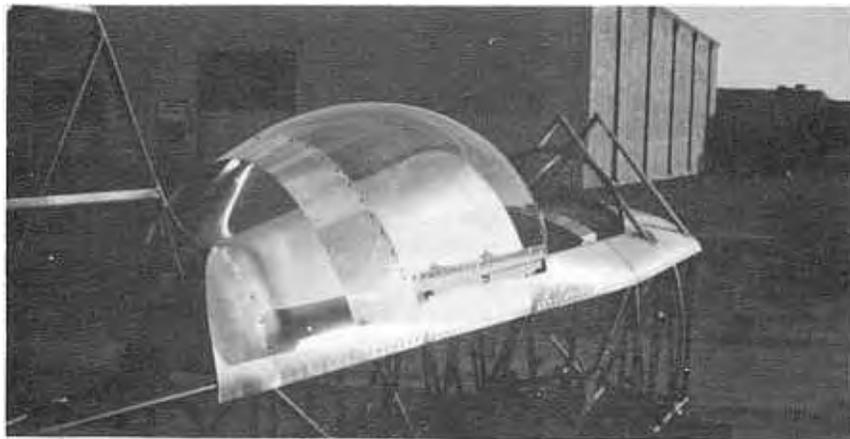
#6

16-788-5



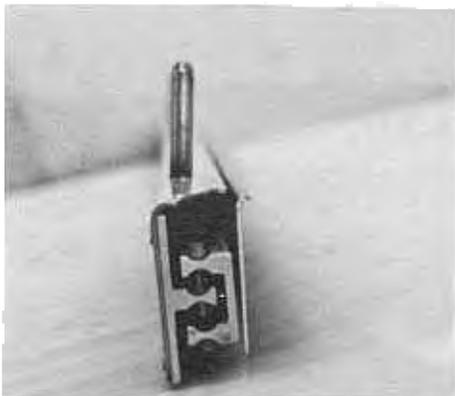
#7.

6-788-8



The Plexiglass Bubble is of our own design and is long enough for the Firebolt, Sun Devil, Starfire, Skybolt and Starduster Too. The F.O.B. price is \$325.00 At the present time it is available ONLY in clear. A light green tint may be available in the future. I'm a firm dis-believer in dark colored canopies due to the limited vision early in the A.M. or at Dusk. It's better br far, to use a Good pair of Sun Glasses which can be removed when the ambient light goes down to a low level.

In Photo #8 we see an end view of the track assembly as removed from the aircraft. The assembly shown is the left hand unit. The outer portion of the track is not shown. It is the outer portion of the track which is bolted to the welded brackets on the airframe and the 2 inner tracks slide on the inboard side. The track assembly is mounted at a 9 degree tilt . The riveted, flanged bracket with the mounting pins is formed to 99 degrees. The outboard flange is made of .032 - 6061-T4 alum. and is riveted to the stationary portion of the track assembly. The coaming skins rivet to this flange. The flange with the pins are made from "Annealed" .050 - 4130 sheet. The pins are made from AN 394 Clevis Pins and are tack welded to the under side of the flange. The pins have been match drilled with 3/8" x .058-4130 bushings. The hole is not visible in the photo (Probably plugged up with a shaving) and is 1/16" in diameter for the early stages of construction. After all welding has been accomplished, the holes are enlarged to .073..... The welding that I refer to is the tack welds to the pins and all welding necessary, to the Canopy Frame Assembly. The reason will be obvious when you are part way through the project and you find that the temporary welding wire pins we use to secure the Canopy Frame to the Flange and Pin Assembly are becoming difficult to insert and remove.



#8

16-655-17

Page 10



#9

16-655  
-12

#10

16-655  
-15

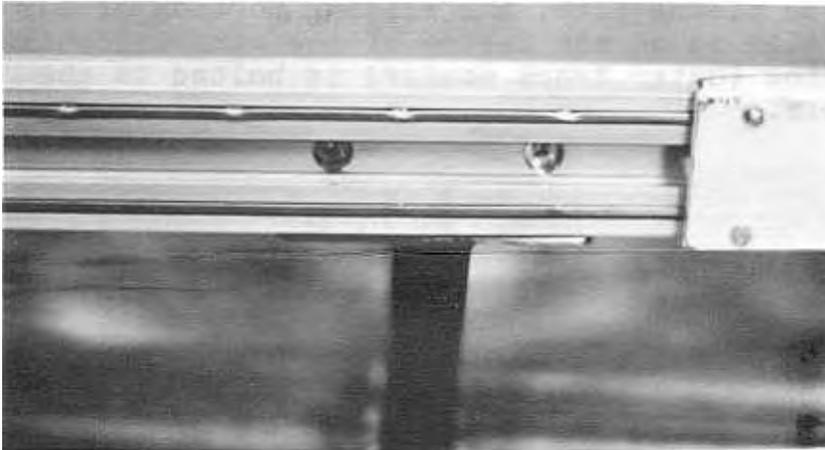
#11

16-655  
-14

Photo # 9 is of the entire LH. Track Assembly. Notice the 4 mounting pins that receive the Canopy Frame Assembly. Also of interest here is the alum. flange to which the Coaming Skins are riveted. The angle of the flange at the left end is about 115 degrees and continues at this angle about 2 thirds of the way towards the aft end where it finishes at 160degrees.

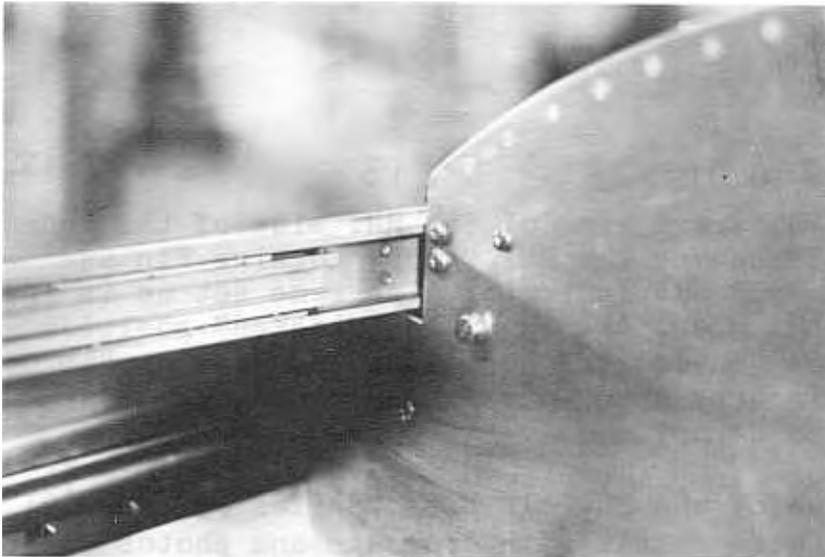
Photo #10 shows the forward end of the Flange and Pin member. The angle and the radius of the cut-off portion is to allow the Flange to clear the windshield and it's associated Fairing. The Alum. Coaming Flange was not riveted to the outer portion of the track when the photo was taken.

Photo #11 shows the aft end of the LH. Flange and Pin member. The angle of the cut-off portion allows the proper alignment of the Headrest Fairing so that it matches the taper of the Turtleneck and the top longeron.



# 12

16-748-15

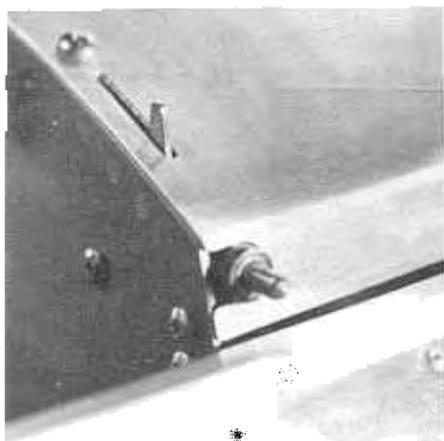


# 13

16-748-18

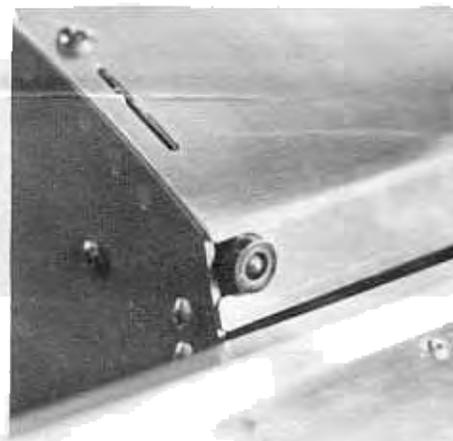
Photo #12 is a shot of the RH. Track Assembly taken in the rear cockpit looking outboard. The Canopy is full aft. At this position you can see the countersunk mounting screws visible through the holes in the inner track member. The nuts (AN315-3R) are not visible in the photo but are tack welded to the Outer Track Fuselage Mounting Bracket. The 2 darker lines running parallel with the track are actually ballbearing strips. There are two more ballbearing strips that in the track member to which the 4130 Flange and Pin member is riveted. All of the members of the Triple Track Assembly start out in life as Alum. extrusions, However, the raceways for the balls are machined with a Broach. This results in a degree of precision that is not matched by any other track. When the tracks are fully extended, there is absolutely no play in the vertical loading plane.

Photo #13 is a view to the left and forward taken from the rear seat. The Coaming Skins are in place. I did not mention it before so please note, the sliding portion of our Canopy installation is on the inside of the airframe while the rigid portion (outer track member) is bolted to the mounting brackets.



#14

16-748-11



#15

16-748-12

Photos #14 and #15 are a view of the RH. side of the rear instrument panel showing the RH. Canopy Locking Pin and the very simple "POP UP" Indicator. The same set up is installed on the LH. side. #14 shows the "Locked" position and #15 shows the "Un-locked" position. The Locking Pin is  $\frac{1}{4}$ " dia. and inserts into matching holes on the Base Frame Rail of the Canopy.

In the next issue of the Skybolt News, Series #5, Vol. #1 we will go into more detail with drawings and photos of the Track Assembly Installation and Making The Canopy Frame.

SERIES #4, VOLUME #6 (Insert

CANOPY PLANS AND CONSTRUCTION MANUAL

Of particular interest to our readers will be the introduction of a complete set of comprehensive, professional quality, Canopy Drawings & Photos approx. April 5, 1982. To be included with the plans, is a Construction Manual. The price for the Drawings and Manual will be \$50 plus \$3 Shipping and Handling.

Due to the fact that there are so many innovations in the design of our canopy, we have started the necessary application for Patents and or Design Patents.

COPYRIGHT INFRINGEMENTS

It has come to my attention that a few Skybolt News subscribers have photo copied the Skybolt News for their friends. Rather than get into a legal battle with anyone, I respectfully ask that you show me the courtesy of refraining from this practice. The small income that I enjoy from the sale of the Skybolt News is really little gratification for the long hours I spend on this publication. I can only say at this point, I will vigorously pursue my legal rights in the event of any future infringement on said Copyrights.

---

SUBSCRIPTION RE-NEWAL

---

Please re-new by subscription to the Skybolt News for SERIES #5 (6 monthly issues starting in Feb. 1982 )

Enclosed is my Check for \$20 ( \$25 for Canada and all other foreign countries). Please mail my Skybolt News to

Name.....

(Please print or type)

Address.....

City.....State.....Zip.....

MAKE ALL CHECKS FOR SUBSCRIPTIONS OR CANOPY PLANS PAYABLE TO : H.G.McKENZIE.....A stamped, addressed, return envelope is enclosed for your convenience.