

LONG-EZ <sup>4M</sup> VARI-EZE AIRCRAFTMAY BE RETROFIT TO THE FOLLOWING AIRCRAFT

LONG-EZ - ●

VARI-EZE - ▲

MODIFICATIONS AND RETROFIT DESIGNSX 1. NOSE MOUNTED - BRAKE CYLINDER ASSEMBLY ●

THE PLANS LOCATION OF THE BRAKE CYLINDERS DID NOT APPEAL TO ME BECAUSE OF EXPOSURE TO ENGINE COMPARTMENT HEAT, DIFFICULTY IN SERVICING, AND THE GENERALLY CROWDED CONDITION IN THAT AREA. THIS WAS DISCUSSED WITH JOHN QUEENER OF SOUTHERN COMPOSITES. SUBSEQUENTLY, JOHN SENT ME A SKETCH OF HIS THOUGHTS ON A NOSE MOUNTED BRAKE SYSTEM. THESE DRAWINGS ARE BASED ON JOHN'S SUGGESTION WITH REVISIONS THAT REFLECT MY EXPERIENCE IN MACHINE DESIGN. THESE WERE COMPLETED 12-2-84.

THE INSTALLATION IS MADE AND OR SERVICED THROUGH THE NOSE HATCH. I HAVE INSTALLED MY HYDRAULIC FLUID RESERVOIRS ON A BRACKET BEHIND THE REAR EDGE OF THE HATCH OPENING AND ON A LEVEL JUST BELOW THE HATCH COVER. FOR THOSE AIRCRAFT WITH THE STANDARD LONG-EZ NOSE THE FORE & AFT LENGTH OF THE HATCH OPENING MIGHT HAVE TO BE INCREASED FOR BATTERY CLEARANCE.

PROVISION IS MADE FOR CHANGING THE FORCE INPUT POINT BETWEEN RUDDER PEDAL AND BRAKE CYLINDER. THIS CHANGES THE "FEEL" FROM THE SAME AS TO LESS SOFT THAN THE ORIGINAL. ALSO, THE CYLINDER HAS THREE SEPARATE MOUNTING POSITIONS WHICH PROVIDE FOR DIFFERENT SIZE PILOTS.

REMOVAL IS ACCOMPLISHED BY DISCONNECTING TWO HYDRAULIC LINES AND BACKING OUT ONE BOLT ON EACH CYLINDER.

THE DESIGN IS PRESENTED ON TWO 24"x36" SHEETS WITH FULL SIZE SECTIONS AND DETAILS. A COMPLETE PARTS LIST IS INCLUDED. THERE ARE 25 SETS OF DRAWINGS OUT NATIONWIDE AND ONE SET IN TURIN, ITALY. THE PRICE IS \$8.15 INCLUDING POSTAGE AND HANDLING.

2. EXTENDED ROUND NOSE ASSEMBLY

THIS DESIGN WAS COMPLETED 1-9-84 ABOUT A MONTH BEFORE CONSTRUCTION WAS STARTED ON THE PROTOTYPE. AFTER INSTALLATION A NEW SET OF DRAWINGS WAS MADE TO INCLUDE REVISIONS REQUIRED DURING THE CONSTRUCTION PERIOD. THIS WAS DONE 2-13/14-85.

THE DESIGN FEATURES A SEPARATE BATTERY COMPARTMENT WITH ACCESS HATCH LOCATED 10 1/2" FORWARD OF THE ORIGINAL POSITION IN ANTICIPATION OF USING THE HEAVIER O-320 ENGINE. THE BATTERY IS COMPLETELY OUTSIDE THE COCKPIT ENVIRONMENT SO THAT NOXIOUS FUMES GENERATED DURING THE CHARGING CYCLE HAVE NO EFFECT ON OCCUPANTS. A TWO PLY BID REMOVABLE FLOOR SUPPORTED BY THE NG-30 BULKHEADS AND SIDE STRIPS OVER THE RUDDER PEDAL/ BRAKE CYLINDER AREA CLOSES OFF MORE THAN HALF THE UPPER

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2. CONTINUED NOSE VOLUME BETWEEN THE BATTERY COMPARTMENT AND F-22. THIS VOLUME IS ESTIMATED TO BE  $1\frac{1}{2}$  CU. FT. AND PROVIDES A SUITABLE BAGGAGE SPACE FOR CLOTHING AND OTHER LIGHT ITEMS. ACCESS IS THROUGH THE ORIGINAL HATCH LOCATION. WHILE THE EXTENDED NOSE IS  $14\frac{3}{8}$ " LONGER THAN THE ORIGINAL IT IN NO WAY CHANGES THE NOSE GEAR LOCATION OR GEOMETRY OR THE NOSE DOWN PARKING ANGLE.

PLANS CONSIST OF THREE 24"x 36" SHEETS OF FULL SIZE DRAWINGS INCLUDING SIDE ELEVATION, PLAN VIEW, AND ALL BULKHEADS, SKETCHES OF ROUGH FOAM PIECES, AND BAGGAGE FLOOR, SOME GUIDELINE INSTRUCTIONS FOR BUILDING THE NOSE, AND, IF YOU PREFER THEM, FLUSH HATCH DOORS.

AS OF 2-15-86 SEVEN SETS HAVE BEEN SOLD.

THE PRICE IS \$26.65 INCLUDING HANDLING AND POSTAGE.

### 3. NOSE GEAR SHIMMY DAMPER

#### A. MASON SHIMMY DAMPER ●▲

IN EARLY 1985 I HAD THE OPPORTUNITY TO INSPECT A COIL SPRING TYPE SHIMMY DAMPER PAUL MASON HAD INSTALLED ON HIS VARI-EZE. I ASKED PAUL FOR PERMISSION TO COPY. PAUL REPLIED "SURE, AS LONG AS YOU SPELL MY NAME RIGHT." A SPRING MANUFACTURER WAS CONTACTED IN CHICAGO TO PRODUCE A UNIT WITH THE REQUIRED CHARACTERISTICS. THE TWO SMALL DRAWINGS WERE MADE 5-8-85. THEY ARE FULL SIZE, HOWEVER, AND INCLUDE ALL DETAILS AND A COMPLETE PARTS LIST.

THERE ARE PRESENTLY 8 SETS OUT TO BUYERS AROUND THE COUNTRY.

THE PRICE IS \$15.65 FOR THE DRAWINGS AND COIL SPRING. POSTAGE AND HANDLING IS INCLUDED.

#### B. LONG EZ/VARI-EZE SHIMMY DAMPER ●▲

WHILE WAITING FOR DELIVERY OF THE SPRINGS MENTIONED ABOVE SEVERAL PEOPLE SUGGESTED INVESTIGATING THE MORE MODERN BELVILLE SPRING WASHER FOR THIS APPLICATION. HAVING AN ENGINEERING CATALOG AT HAND A SUITABLE UNIT WAS SELECTED AND ORDERED FROM THE MANUFACTURER. FULL SIZE DRAWINGS AND PARTS LIST WERE MADE 5-1-85 — BEFORE THOSE FOR THE COIL SPRING.

BY COMPARISON THE BELVILLE SPRING HAS A CAPABILITY OF OVER  $2\frac{1}{2}$  TIMES THAT OF THE COIL, AND IT CAN BE LUBRICATED. HOWEVER, IN ENGINEERING ONE SELDOM GETS SOMETHING FOR NOTHING, AND THIS CASE IS NO EXCEPTION. FROM THE POINT THAT THE NUT STARTS TO COMPRESS THE STACKED WASHERS TO THE POINT OF DEVELOPING MAXIMUM FORCE (A DISTANCE OF ONLY .057") THE NUT WILL HAVE ROTATED ONLY  $330^\circ$  OF ONE REVOLUTION! THUS, ADJUSTMENT BECOMES A LITTLE MORE CRITICAL. ALSO THE BELVILLE WASHERS ARE STEEL AND SUBJECT TO RUST UNLIKE THE STAINLESS STEEL COIL. THE WASHERS ARE AVAILABLE IN STAINLESS, BUT AT A PROHIBITIVE 6X THE PRESENT COST!

THERE ARE 7 SETS OUT TO BUYERS.

THE PRICE IS \$10.65 FOR THE DRAWINGS AND 5 BELVILLE SPRING WASHERS INCLUDING POSTAGE AND HANDLING.

#### 4. RETRACTING NOSE GEAR DOOR KIT ●

THE HALF OPEN NOSE GEAR WELL, SIMPLE THOUGH IT IS, HAS ALWAYS APPEARED TO ME TO BE OUT OF PLACE ON SUCH A SLEEK AIRPLANE. EARLY ON I DECIDED ONE DAY I'D DO SOMETHING ABOUT IT. COVER THE OPENING AND SEAL THE AIR LEAKS. 10-27-85 THE DRAWINGS FOR A TWO DOOR SYSTEM WERE COMPLETED AND MATERIALS ORDERED. INSTALLATION ON THE PROTOTYPE WAS COMPLETED 11-22-85.

LATER, AS I WAS LOOKING OVER DAN MAHER'S BEAUTIFUL VELOCITY, HE SUGGESTED GOING TO A SIMPLER SINGLE DOOR DESIGN AS HE HAD DONE ON HIS PLANE. HIS FORCE INPUT POINT FOR DOOR ACTUATION IS NEAR THE NOSE WHEEL. THIS IS QUITE A DISTANCE FROM THE GEAR LEG PIVOT WITH A BIG MECHANICAL DISADVANTAGE. DAN'S SYSTEM WILL HANDLE IT FINE BECAUSE GEAR RETRACTION IS HYDRAULICALLY POWERED ON HIS PLANE.

EARLIER, I HAD VIEWED THE INSTALLATION OF A TWO DOOR SYSTEM PAUL MASON HAD DESIGNED FOR HIS VARI-EZE. A SIMPLER RETRACTION MECHANISM TO BE SURE, BUT PAUL'S FORCE INPUT POINT IS AT THE NG-15A CASTING ADJACENT TO THE TIRE. THERE IS A VERY DECIDED MECHANICAL DISADVANTAGE HERE, AND HE MUST LUBRICATE ALL HINGES AND SLIDING SURFACES REGULARLY TO KEEP THE FORCE ON THE RETRACTION CRANK TO A MINIMUM.

JIM CARLIN USING A SIMILAR MECHANISM HAS INSTALLED A SEPARATE RETRACTION/EXTENSION CONTROL TO HIS DOOR LINKAGE. THUS, JIM MUST CRANK UP THE GEAR AND THEN PULL THE DOORS CLOSED. VISA VERSA ON EXTENSION.

NOW THERE IS NOTHING WRONG WITH THE ABOVE SYSTEMS. THEY ARE SIMPLE AND THEY WORK. BUT EVERY DESIGN REFLECTS THE GOAL OF THE DESIGNER. MINE WAS TO USE THE RUTAN RETRACTION/EXTENSION MECHANISM ONLY, AND TO HAVE THE NOSE GEAR DOOR(S) OPERATE THROUGH THAT MECHANISM AUTOMATICALLY WITHOUT THE PILOT BEING REQUIRED TO EXERT ANY NOTICEABLE ADDITIONAL FORCE ON THE CRANK HANDLE NG 64.

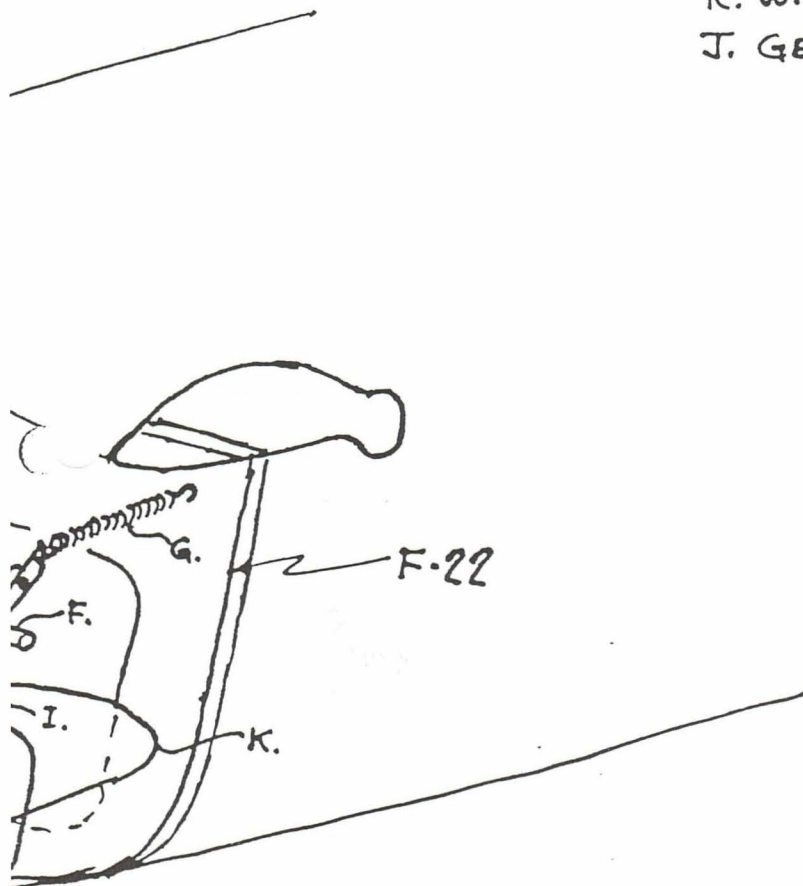
TAKING DAN'S SUGGESTION REGARDING A SINGLE DOOR AS A GOOD IDEA A NEW SET OF DRAWINGS WERE PREPARED. THE DECISION WAS ALSO MADE TO MAKE THE NEW DESIGN SO THAT IT COULD BE RETROFIT TO A STANDARD NOSE LONG-6Z. THE SINGLE DOOR DESIGN REDUCED THE NUMBER OF METAL PARTS TO BE MADE FROM 22 TO 16, WELDED PARTS FROM 6 TO 4, PURCHASED ITEMS SUCH AS BUSHINGS, ROD END BRGS., ETC FROM 17 TO 12, HARDWARE FROM 62 TO 51 ITEMS, AND RIVETS FROM 60 TO 42. THANKS DAN! EVEN SO THAT'S STILL 121 ITEMS. THEY WEIGH 12 OZ. TOTAL.

IN ADDITION TO THE ABOVE THE KIT ALSO CONTAINS TWO 24" X 36" SHEETS OF INSTALLATION DRAWINGS THAT ARE FULL SIZE. INCLUDED TOO IS A PARTS LIST AND A COMPLETE MODIFICATION, INSTALLATION, AND SET-UP PROCEDURE.

THE TWO DOOR VERSION IS INSTALLED ON THE PROTOTYPE, AND THE SINGLE DOOR DESIGN IS NEARING COMPLETION IN THE TEMPE, AZ. AREA.

PRICE OF THE SINGLE DOOR KIT IS \$159.95 COMPLETE INCLUDING SHIPPING AND HANDLING. A TWO DOOR KIT CAN BE MADE AVAILABLE AT A PROPORTIONATELY HIGHER PRICE.

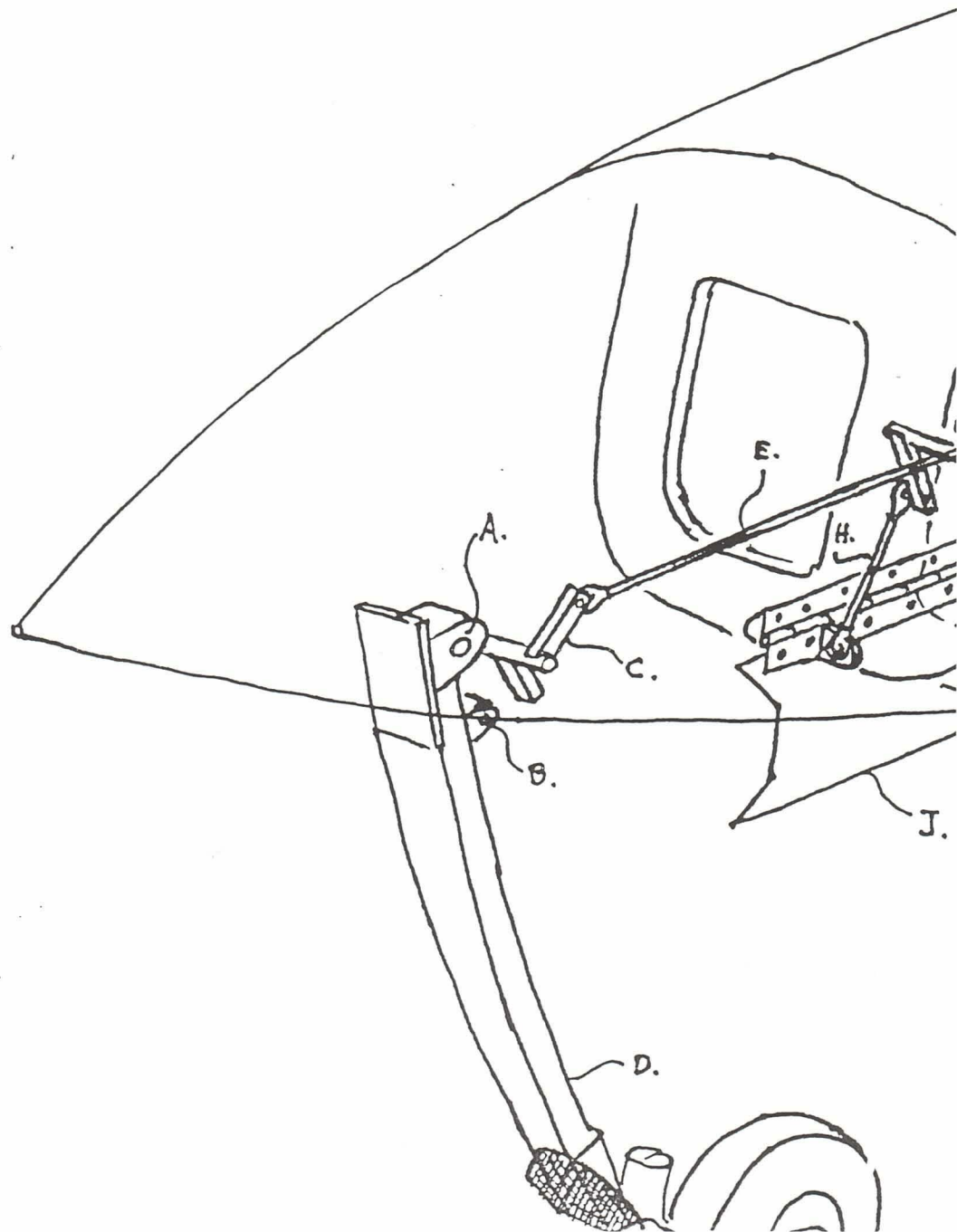
- A. NOSE GEAR PIVOT
- B. CLOSING ACTUATOR
- C. PRIMARY BELCRANK
- D. GEAR LEG
- E. CONNECTING ROD
- F. SECONDARY BELCRANK
- G. OPENING SPRING
- H. DOOR ACTUATOR
- I. EXTRUDED HINGE
- K. WHEEL OPENING
- J. GEAR DOOR

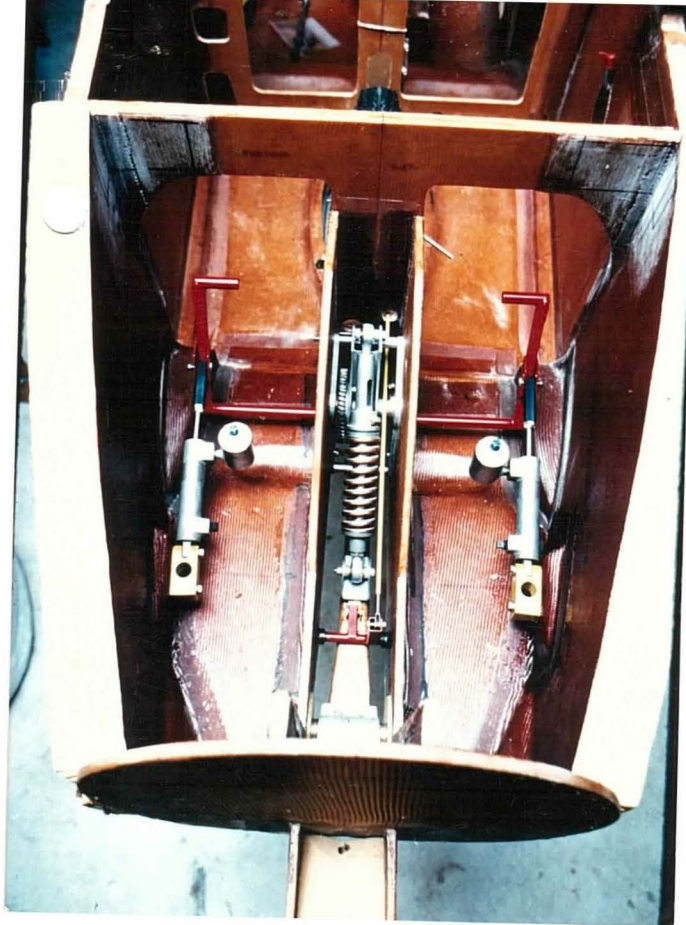


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# RETRACTING GEAR DOG

NORMALLY OPEN SYSTEM





IN FRONT OF F-22 42H

13ins7

AIRCRAFT BELONGING  
TO CHRIS CHULAMANIS  
WITH EXTENDED ROUND  
NOSE, NOSE MOUNTED  
BRAKE CYLINDERS, AND  
GEAR DOOR RETRACTING  
SYSTEM - SUMMER 1986

AFT OF F-22

42H

NB HAS BEEN REMOVED AND IS  
REPLACED BY A LONGER COVER THAT  
FITS BETWEEN THE REAR OF F-22  
TO THE FRONT OF INST. PANEL BUL  
HEAD.

NOTE COIL SPRING TYPE SHIMMY  
DAMPER INSTALLED ON NOSE GEAR  
FORK

13ins7