



**SAIB:** CE-10-08

**SUBJ:** Wings: Zodiac CH601XL and CH650 Wing Structural Modifications     **Date:** November 7, 2009

---

*This is information only. Recommendations aren't mandatory.*

## **Introduction**

This Special Airworthiness Information Bulletin informs you of an airworthiness concern on all variants of Zodiac CH601XL and CH650 airplanes, all serial numbers, including special light-sport category aircraft (S-LSA), experimental light-sport aircraft (E-LSA), and experimental amateur-built aircraft.

## **Background**

Since April 2009, the FAA has been conducting a special review of the Zodiac CH601XL and the nearly identical CH650 to evaluate design and operational details of these aircraft. This review was a continuation of efforts to investigate several in-flight structural failures of the CH601XL dating back to 2005. Five in-flight structural failure accidents have occurred in the United States and several abroad. The U.S. accidents involved two S-LSA, one E-LSA, and two experimental amateur-built kit aircraft. The design of all CH601XL & CH650 airplanes is essentially the same, but only the S-LSA aircraft are designed and produced to ASTM International LSA standards. We quickly launched the FAA special review because of the accidents exhibited signs of structural failures. After the review we made a determination that these accidents did not clearly indicate a single root cause. Instead, it implicated the potential coupling of design and operational aspects of the aircraft.

Our analysis did reveal several areas of concern regarding the CH601XL design that may impact the overall safety of the design. Those causing the greatest concern are as follows:

- **Wing structure:** FAA analysis shows bending loads used to design the wing structure were non-conservative and the basic static strength of the CH601XL/CH650 does not appear to meet the intent of the ASTM standards for a 600kg (1320 lb) airplane, given the current flight envelope in the Pilot Operating Handbook.
- **Structural Stability:** Other aviation authorities have noted the presence of buckling in the wing structure, including in the center section. Such structural instabilities can have a significant effect on static strength and flutter characteristics.
- **Flutter:** Our detailed review of available flutter analysis reports was inconclusive. However, accident photos clearly indicated flutter was present during the in-flight structural failures. The FAA believes flutter may either be a first order root cause of in-flight structural failure or a secondary cause after some initial wing structural deformation or twisting.
- **Airspeed calibration:** Calibration procedures do not appear to adequately account for basic static pressure source error due to the location of the static port. This could lead to potential airspeed indication anomalies, particularly since the CH601XL/650 derivatives can be delivered/built with several different airspeed indicators installed or without an indicator at all. The situation could lead to the potential of operating the airplane above the maneuver speed and/or the design cruise speed, potentially leading to structural failure.

- **Stick force characteristics:** Flight test data from foreign authorities indicates at aft center of gravity the stick forces become very light. The FAA believes this may be a contributing factor in structural failure accidents if coupled with operations over gross weight, at speeds higher than  $V_A$ , and/or for aircraft loaded improperly. In such conditions, it would be very easy to dynamically load the CH601XL/CH650 wing beyond its design structural load limit.

## Recommendations

In order to prevent potential catastrophic structural failure, we strongly recommend that all owners and operators of Zodiac CH601XL/CH650 comply with actions outlined in a forthcoming Aircraft Manufacturing & Design, LLC (AMD) Safety Directive / Safety Alert to address the above-referenced concerns before further flight.

For SLSA owners and operators: We remind all owners and operators of their regulatory obligation to comply with Safety Directive / Safety Alert issued by AMD in accordance with the ASTM International consensus standards safety directive process and recommend the following:

- Reference 14 CFR §21.190(c)(5) – The manufacturer’s requirement to issue safety directives.
- Reference 14 CFR §91.327(b)(4) – Owner/operator compliance with each safety directive.
- Obtain and install AMD’s modification kit (i.e., major alteration) per drawings and instructions.
  - ✓ Contact AMD for any requests to correct the unsafe condition in a manner different from that specified in the safety directive.
  - ✓ Since the AMD safety directive adheres to the applicable consensus standard, the FAA will not likely issue any waivers from the provisions of the safety directive.
- Adhere to the manufacturer’s drawings and instructions. These drawings and instructions address the structural design changes that are required to meet the ASTM design and performance standard T they also address other operating limitations.
- If necessary, obtain a special flight permit to fly the aircraft to a location where the safety directive modifications can be made. The FAA may add special requirements for operating your aircraft to a place where the modifications can be done. The FAA may also decline to issue a special flight permit in particular cases if we determine you cannot move the aircraft safely. To apply for a special flight permit, follow the procedures in 14 CFR 21.199.

For amateur-built and E-LSA owners and operators: Due to shared design characteristics that amateur-built and E-LSA aircraft have with S-LSA, we strongly recommend compliance with the drawings and instructions contained in the AMD Safety Directive/Safety Alert and recommend the following:

- Reference 14 CFR §91.7: “(a) No person may operate a civil aircraft unless it is in an airworthy condition. (b) The pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight. The pilot in command shall discontinue the flight when un-airworthy mechanical, electrical, or structural conditions occur.”

- Obtain and install the kit manufacturer's structural modification kit. The modification kit addresses the structural design changes and operating limitations required to meet a safe condition for operation.
- Contact the kit manufacturer with any modifications already incorporated to correct the identified unsafe condition to validate safety-of-flight issues.
- If necessary, obtain a special flight permit to fly the aircraft to a location where the safety directive modifications can be made. The FAA may add special requirements for operating your aircraft to a place where the modifications can be done. The FAA may also decline to issue a special flight permit in particular cases if we determine you cannot move the aircraft safely. To apply for a special flight permit, follow the procedures in 14 CFR 21.199.

**For Further Information Contact**

Wes Ryan, Manager ACE-114, Programs & Procedures, FAA Small Airplane Directorate, 901 Locust, Kansas City, MO 64106; Phone: (816) 329-4111; Fax: (816) 329-4090; e-mail: wes.ryan@faa.gov.

**(Optional) For Related Service Information Contact**

AMD, LLC (**SLSA Manufacturer**)  
 Heart of Georgia Regional Airport  
 415 Airport Road,  
 Eastman, Georgia 31023 USA  
 Email: <http://www.newplane.com/>

Mailing address:  
 P O Box 4277 Eastman Georgia 31023 USA  
 TEL: 478-374-2759  
 FAX: 478-374-2793

Zenith Aircraft Company (**Kit Manufacturer**)  
 Mexico Memorial Airport, PO Box 650  
 Mexico, Missouri, 65265-0650 USA.

TEL: 573-581-9000  
 FAX: 573-581-0011  
 Email: <http://www.zenithair.com/>



Aircraft Manufacturing & Design LLC  
Heart of Georgia Regional Airport  
441 Airport Road, Eastman Georgia 31023 USA  
www.newplane.com  
TEL: (478) 374-2-SKY FAX:(478) 374-2793

**SAFETY ALERT / SAFETY DIRECTIVE**

**Release Date:**

Saturday, November 07, 2009 (revision 1)

**Effective Date:**

Immediate

**Subject/Purpose:**

Mandatory Upgrade, before next flight.

**Limitations:**

None, once upgrade is complete.

**Affected Models:**

Aircraft Manufacturing & Development and Aircraft Manufacturing & Design (AMD) Zodiac CH 601 XL and CH 650 aircraft.

Owner/Operators of CH 601 XL and CH 650 aircraft in the Experimental Amateur Built category are encouraged to reference related information from Zenith Aircraft, Co. available at:

<http://www.zenithair.com/news/ntsb-astm-4-09a.html>

**Serial numbers:**

All

**Notification Number:**

Saturday, November 07, 2009

**Does this Notice supersede another document?**

Yes – Aircraft POH and all other aircraft documents that makes reference to flight limitations and Weight & Balance including pre-flight check list.

## **Discussion:**

This Safety Alert is based on the “Chris Heintz” letter of July 7, 2009 and on the FAA’s and other airworthiness authority’s review of the design. Chris Heintz is the designer and owner of the Zodiac designs; AMD has a license agreement with Mr. Heintz for the manufacturing of the Zodiac 601XL and 650 in the USA under the SLSA category.

A number of accidents involving the CH 601 XL aircraft type have occurred in 2006-2009 causing different authorities to conduct full reviews of the design.

Two aircraft (a CH 601 XL as well as a CH 650) were delivered to a flutter specialist in Germany for the purpose of thorough Ground Vibration Testing. It is important to note that both aircraft used in these tests were professionally built and, therefore in compliance with design specifications. The result of these real-world tests (not just a computer simulation) can be viewed on the AMD web site (at [CH 650](#) and [ZODIAC XL](#)). The tests concluded that there are no flutter concerns for these planes. However, an on-going question that remains is: is flutter possible if a similar aircraft is not built or maintained as per the design specifications?

Chris Heintz agrees that one way to address this question is to follow the UK LAA’s mandated upgrade to install aileron counter balance weights. AMD is now mandating this modification as part of the upgrades covered by this Safety Alert.

Additionally, the German laboratory in charge of the GVT also conducted non-linear test analysis of the design and concluded that the aileron bellcrank area of the CH 601 XL could be reinforced to minimize the possibility of non-linear-type vibrations in that area. This is why the reinforcement parts for this area are also part and parcel of the upgrade kit mandated by this Safety Alert.

Finally, Chris Heintz completed a series of static load tests this summer where the Zodiac design was load tested by as much as 6% beyond the SLSA requirements - without failure. This Safety Alert includes extra material which was not part of the tested airframes, further increasing the safety margins of the seat area, main spar bolt area, and rear spar area. The current upgrade kit therefore increases a number of safety margins on the aircraft even further than those on the tested airframes.

The purpose of this multi-part upgrade kit is to not only comply with the different interpretation of regulations by different authorities, but to also make sure that the aircraft is significantly tougher overall and less prone to vibrations, including everyday wear-and-tear.

Overloading of the airframes is still an important concern. In a number of cases, this overloading was probably due to exceeding  $V_c$  in turbulent conditions - which significantly increases the loads on the airframe. It is therefore imperative that all Zodiac 601XL and 650 aircraft be retrofitted with the upgrade kit covered in this Service Alert, and that pilots become and remain well aware of the aircraft limitations including  $V_c$ , and that the ASI of every aircraft be well calibrated and properly marked.

### **Corrective Action:**

Complete the installation of the upgrade kit as per the following.

1. All work is to be performed by a certified mechanic as per maintenance manual “(a / b) Major Alterations / Major Repairs. Must be pre-approved by the Manufacturer or other identity and performed by an FAA certified A&P” or FAA certified repair station.
  - a) Complete the upgrade by using the following information:
    - i. Drawing 6-ZU-1, 6-ZU-2, 6-ZU-3, and 6-ZU-4.
    - ii. Photo guide with construction standards
    - iii. Use “FAA AC-43.13.-1B and 2A if additional information is required
    - iv. Use the UK LAA's modification MOD/162B/004 dated 18/08/09 for only the installation of the aileron counter balance weights. Drawings and assembly instructions are part of the modification.
  - b) Additionally:
    - i. When removing and reassembling the wings, ailerons and flaps, follow the procedure in the service manual section VII
    - ii. When removing and reinstalling the wing tanks follow the procedure in the service manual section VIII
    - iii. Inspect the aircraft using the [Zodiac series checklist](#). This is a 41-page checklist to help owners thoroughly inspect their aircraft before flying again.
    - iv. Use the checklist with the Service Manual as you complete a 100 hour inspection as per table 1.
    - v. Ground and flight test procedures for the return to service after upgrade Follow Appendix 1 for “major repairs and alterations”
    - vi. For calibration of the ASI with a GPS, proper outside air temperature must be taken with a temperature gauge while doing the flight test as actual outside air temperature is required to allow proper correction.
    - vii. Complete a new weight & balance as per procedure in POH section 4. Update the “INSTALLED EQUIPMENT LIST”, “WEIGHT & BALANCE REPORT” and “WEIGHT & BALANCE UPATE” in the POH.

In addition to this and before each flight:

1. Check all control cable tensions by hand. If in doubt about the cables being properly tensioned, check them with a calibrated cable tension gauge. If necessary, adjust the cable tension to the proper values. If unsure, get a licensed mechanic to check or adjust the cables.

**WARNING:** Do not fly with control cables that are too loose or too tight.

2. Check for free play in the aileron control system. When holding the control stick stationary, beyond minor flexing, there should be no free play in the system when gently pushing up or down on the aileron trailing edges. Note that if the ailerons are not locked when the aircraft is parked outside, wind can damage the system.

**WARNING:** Do not fly with loose, sloppy or damaged controls.

3. Check the flaps for positive firm contact with the flap stops when in the “up” (retracted) position. Check for movement by gently pushing up and down on the flap trailing edges. **WARNING:** The flap system can get damaged if the flaps are stepped on. Do not fly with loose or damaged flaps.

4. When placing luggage/items in the wing lockers, baggage area behind seats, or in other places, check that it is well secured before take-off.

**WARNING:** Do not fly with loose luggage or other items in the aircraft.

5. Make sure the colored arcs on your ASI all properly indicate the correct speed limits (CAS). Incorrect markings could cause the pilot to unintentionally exceed aircraft limitations. Before flying your aircraft, know all the flight limitations including VA and Vc. Mark VA on your airspeed indicator (or panel). Remember that all aircraft limitations should be included in your flight manual (POH).

6. Check that your canopy closes and latches properly on both sides. If in doubt, add a secondary latching system as recommended by the Australian CAA. If your canopy does open in flight, keep your hands on the controls, lower your speed to approximately 60 knots, keep flying the aircraft and land as soon as practicable.

**WARNING:** Do not try to close the canopy in flight: Fly the aircraft!

7. “Self checkout” is not recommended. Before flying the aircraft, make sure that you have been properly checked out and that you are familiar with all flight limitations and the handling characteristics (feel and responsiveness) of the controls. Remember that, as with any light aircraft, if you encounter unexpected turbulence while cruising, ride it out rather than fight it – and slow down!

**REMINDER TO PILOTS:** Always get to know a new aircraft you plan to fly before taking the controls (this applies to any aircraft). A thorough condition inspection of the aircraft is essential; learn the operating limitations from the POH (and respect them); and get properly checked out to be familiar with the aircraft’s handling qualities.

## **OPERATING LIMITS AFTER UPGRADE IS COMPLETE:**

1. The aircraft **MUST** comply with all Safety Directives issued by AMD except for operating limitations of [July 08, 2009](#) .
2. The aircraft **MUST** have a current Weight and Balance, and should be within limits.
3. Aircraft VNE to be as per POH of November 2009
4. Gross weight, baggage and passenger limits to be as per POH of November 2009
5. Your POH and an instrument placard **MUST** reflect POH marking of November 2009.
6. Use applicable sections of Appendix 1 in the Service Manual of November 2009 to calibrate your ASI.
7. Use November 2009 POH only after the aircraft has been signed off by a certified mechanic, clearly stating that the aircraft complies with this Safety Alert.

### **Reminder**

AMD reminds the Owner/Operator of AMD aircraft that compliance with all Safety Directives, Aircraft Operating Instructions, Maintenance Manuals as well as the reporting of any and all Safety of Flight or Service Difficulties by the Owner/Operator is *mandatory* for the operation of an SLSA aircraft.

- [AMD Safety Alerts](#), Service Bulletins and Notices can be viewed and downloaded at:  
[http://www.newplane.com/amd/CH2000\\_Service.html](http://www.newplane.com/amd/CH2000_Service.html)
- UK LAA aileron balance can be downloaded from:  
[http://www.lightaircraftassociation.co.uk/engineering/engineering\\_updates.html](http://www.lightaircraftassociation.co.uk/engineering/engineering_updates.html)

# Zenair Europe

## Safety Notice



This SAFETY NOTICE (SN) has been issued by Zenair SARL (Europe).

<b>S.N. Number:</b>	<b>ZE-2009-04</b>
<b>Date of issue:</b>	<b>November 22, 2009</b>
<b>Subject:</b>	<b>Actions and upgrades from AMD Safety Alert of Sat. November 7, 2009.</b>
<b>Affected Models:</b>	All Zenair CH 601 XL/CH 650 models built and operated in Europe at more than 450kg +5% (UL) and up to MTOM of 600 kg. <b>NOTE: THIS SAFETY NOTICE DOES NOT APPLY TO ULM MODELS!</b>
<b>Serial Number(s):</b>	All affected models built by CZAW or assembled from a CZAW kit. All affected models assembled from a US-made kit, up to serial #6(5)-6890
<b>Manufactured by:</b>	Czech Aircraft Works (CZAW) and others, from plans and/or from kits.
<b>Purpose:</b>	To increase safety margins and reduce the risk of accidents as a result of overloading the aircraft and to provide a process whereby operating limitations currently in place can be lifted, Zenair Europe is urging all owners and operators of affected models in Europe to upgrade their aircraft as requested by designer Chris Heintz and as outlined in the AMD Safety Alert of 11/07/2009.
<b>Directed Action(s):</b>	Follow all instructions contained in the AMD Safety Alert including the latest plans and instructions for the required upgrade. In Europe, kits containing all necessary parts for the upgrade will be available from ULM-Technologie (+33.(0)3.27.33.20.20).
<b>Effective date:</b>	<b>Immediately, before next flight.</b>
<b>Compliance:</b>	Before next flight, and/or in compliance with local regulations; <b>CAUTION: Regional CAAs may have differing requirements;</b> <b>Owners should always comply with rules and regulations that apply to them!</b>
<b>References:</b>	<ul style="list-style-type: none"> <li>• <b>FAA SAIB:</b> <a href="http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf">http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf</a></li> <li>• <b>AMD Safety Alert:</b> <a href="http://www.newplane.com/amd_downloads/SAFETY%20ALERT%20November%207%202009.pdf">www.newplane.com/amd_downloads/SAFETY%20ALERT%20November%207%202009.pdf</a></li> <li>• <b>Zenith Aircraft Info:</b> <a href="http://www.zenithair.com/news/ntsb-astm-4-09a.html">http://www.zenithair.com/news/ntsb-astm-4-09a.html</a></li> <li>• <b>ULM-Technologie:</b> <a href="http://www.ulmtechnologie.com/">http://www.ulmtechnologie.com/</a></li> </ul>

### Remarks:

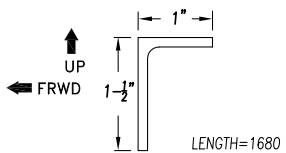
Compliance with this Safety Notice should be recorded in the aircraft's maintenance log.

**Address inquiries concerning this Service Bulletin to your nearest Zenair representative or to:**

Zenair Sarl Z.I. No.2 Aérodrome de Valenciennes 59121 PROUVY, France

Tel: 0033-(0)6-89-26-27-98 e-mail: Europe@zenair.com

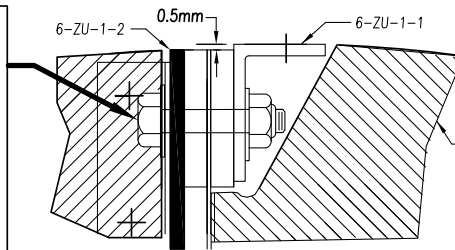
[www.zenairulm.com](http://www.zenairulm.com)



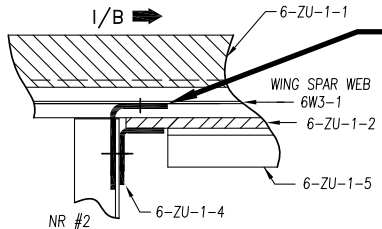
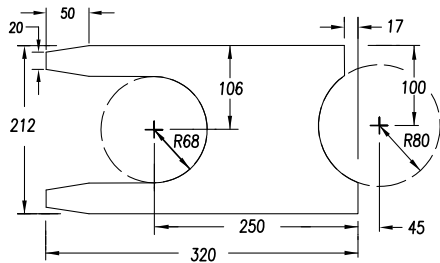
**6-ZU-1-1**

DRILL OUT SOLID RIVETS.  
 CUT SPAR ANGLE 6W3-6 AT 1680MM FROM INBOARD END.  
 TRIM BACK TOP FLANGE ON REAR RIBS TO CLEAR 6-ZU-1-1.  
 INSTALL EXTRUSION WITH SOLID RIVETS MS20470AD-6-14 AND  
 MS20470AD-6-15 (QTY=4) MS20470AD-6-10  
 USE BOLTS IN ROOT AREA 6-ZU-1-2 AND ONE BOLT IN LIEU OF  
 RIVET AT OUTBOARD END OF EXTRUSION.

DRILL OR REAM ALL BOLT HOLES TO ENSURE CLOSE TOLERANCE  
 FIT OF BOLTS IN HOLES. IT IS ACCEPTABLE TO REPLACE  
 SOLID RIVETS BY AIRFRAME BOLTS OF EQUAL DIAMETER.



**1** **EXTRUSION ANGLE**  
 EXT. 6061-T6 1"x1-1/2"x1/8" (2 REQ'D)



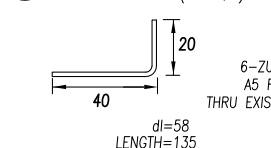
**6-ZU-1-3**  
 REPLACE 6W3-9 WITH 6-ZU-1-3.  
 TRIM 1/8" OFF END OF NOSE RIB#1 AND 2  
 RIB SANDWICHED BETWEEN 6-ZU-1-3  
 AND 6-ZU-1-4. RIVET TO SIDE OF RIB

**6-ZU-1-2 AIRFRAME BOLTS**

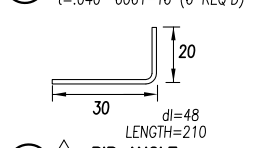
REMOVE NOSE RIB #1, #2 and #3. DRILL  
 OUT BOTTOM SOLID RIVETS TO ADD  
 6-ZU-1-2 ON FRONT SIDE OF SPAR.

- TOP (REFERENCE NUMBER)
- 1 AN4-12A
  - 2 AN3-11A
  - 3 AN3-12A ANGLE NR #1 (2 WASHERS)
  - 4 AN3-11A (2 WASHERS)
  - 5 AN3-11A (2 WASHERS)
  - 6 AN3-12A ANGLE NR#2 (2 WASHERS)
- BOTTOM
- 7 AN4-11A
  - 8 AN3-11A (2 WASHERS)
  - 9 AN3-11A ANGLE NR#1
  - 10 AN3-11A 6-ZU-1-5
  - 11 AN3-11A 6-ZU-1-5
  - 12 AN3-11A ANGLE NR#2
- AN3-6A END OF 6-ZU-1-1

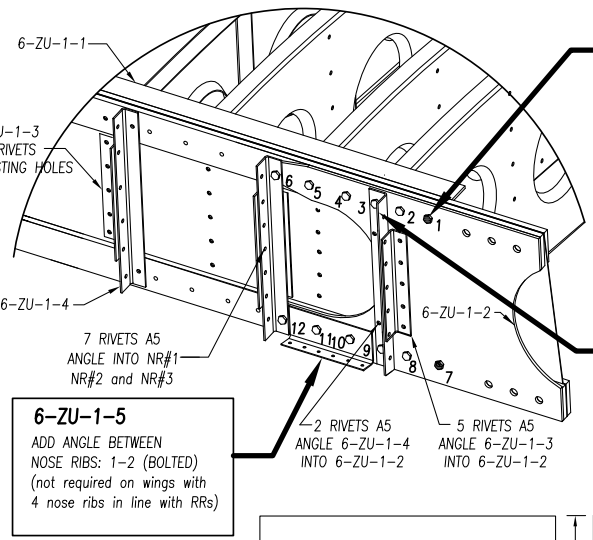
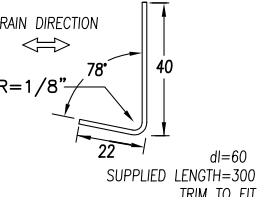
**2** **WING ROOT DOUBLER**  
 t=.125" 6061-T6 (2 REQ'D)



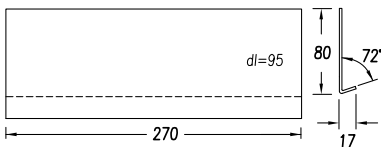
**3** **NOSE RIB ANGLE**  
 t=.040" 6061-T6 (6 REQ'D)



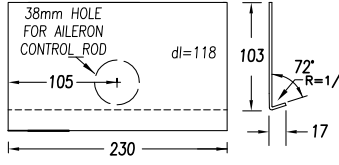
**4** **RIB ANGLE**  
 t=.040" 6061-T6 (6 REQ'D)



**6-ZU-1-5**  
 ADD ANGLE BETWEEN  
 NOSE RIBS: 1-2 (BOLTED)  
 (not required on wings with  
 4 nose ribs in line with RRs)



**6-ZU-1-4**  
 TRIM 1/8" OFF BACK OF NR#1  
 ADD .040" ANGLE TO REPLACE 6W3-9

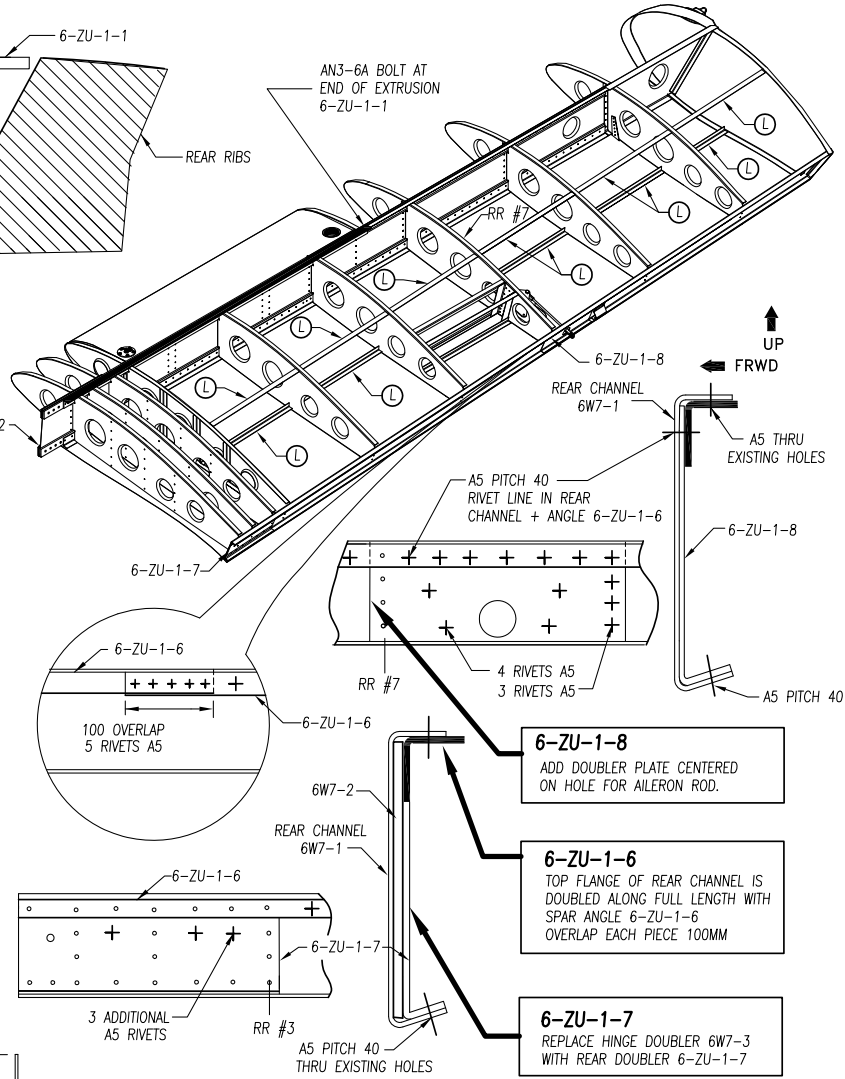


**5** **BOTTOM CAP ANGLE**  
 t=.063" 6061-T6 (1 REQ'D)

**6** **CHANNEL ANGLE**  
 t=.040" 6061-T6 (4REQ'D)

**7** **REAR CHANNEL DOUBLER**  
 t=.040" 6061-T6 (2 REQ'D)

**8** **AILERON ROD HOLE DOUBLER**  
 t=.032" 6061-T6 (2 REQ'D)



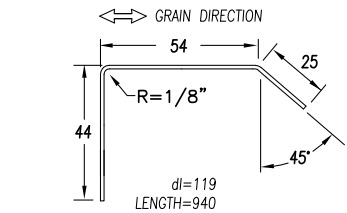
**6-ZU-1-8**  
 ADD DOUBLER PLATE CENTERED  
 ON HOLE FOR AILERON ROD.

**6-ZU-1-6**  
 TOP FLANGE OF REAR CHANNEL IS  
 DOUBLED ALONG FULL LENGTH WITH  
 SPAR ANGLE 6-ZU-1-6  
 OVERLAP EACH PIECE 100MM

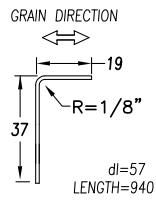
**6-ZU-1-7**  
 REPLACE HINGE DOUBLER 6W7-3  
 WITH REAR DOUBLER 6-ZU-1-7

**6-X-0 TECHNICAL DATA** CH 601 XL / 650 ASTM SLSA REQUIREMENTS:  
 GROSS WEIGHT 1320 LBS (600kg), VNE =160MPH (260 Km/h), ULTIMATE LOAD +6/-3G

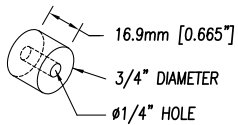
<b>ZODIAC</b> CH 601 XL / 650	UPGRADE DRAWINGS WING SPAR & REAR CHANNEL	<b>6-ZU-1</b>
<small>Copyright© 2009 CHRIS HEINTZ</small>		<small>DATE: 25 JAN 2010</small>



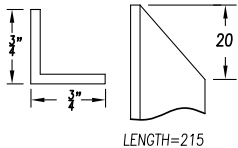
1 TOP DOUBLER  
t=.063" 6061-T6 (1 REQ'D)



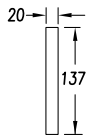
2 SEAT FRONT ANGLE  
t=.063" 6061-T6 (1 REQ'D)



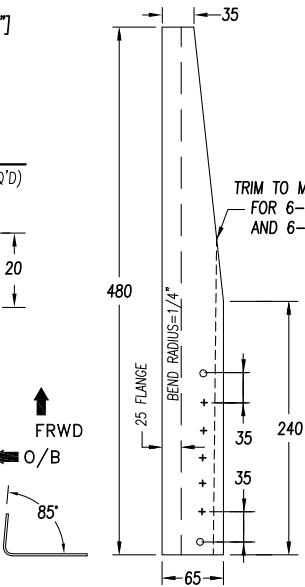
3 WEB SPACER  
0.750" O.D. x 0.250" I.D. (4 REQ'D)  
6061-T6 ROD



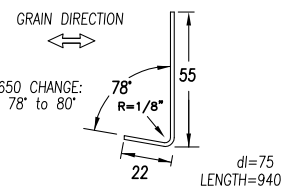
4 SPAR UPRIGHTS  
3/4"x3/4"x.093" 6061-T6  
EXTRUSION (8 REQ'D)



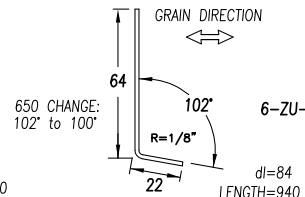
5 UPRIGHT SHIMS  
t=.063" 6061-T6 (8 REQ'D)



6 FRONT WING UPRIGHTS  
t=.125" 6061-T6 (1L + 1R REQ'D)



7 FRONT BOTTOM ANGLE  
t=.063" 6061-T6 (1 REQ'D)  
650 USE 65-ZU-2-7



8 REAR BOTTOM ANGLE  
t=.063" 6061-T6 (1 REQ'D)  
650 USE 65-ZU-2-8

### AIRFRAME BOLTS

WING ATTACHMENT BOLTS:  
1 NAS6205-23 QTY=4  
2 NAS6205-22 QTY=4  
3 NAS6205-22 QTY=4

REAR WING ATTACHMENT  
AN5-6A qty=2, REF 6-S-3

CENTER SECTION BOLTS:  
4 AN4-20A QTY=4  
5 AN4-20A QTY=4  
6 AN4-16A QTY=2

(REFERENCE NUMBERS - SEE BOTTOM DIAGRAM.  
SAME BOLTS TOP AND BOTTOM)

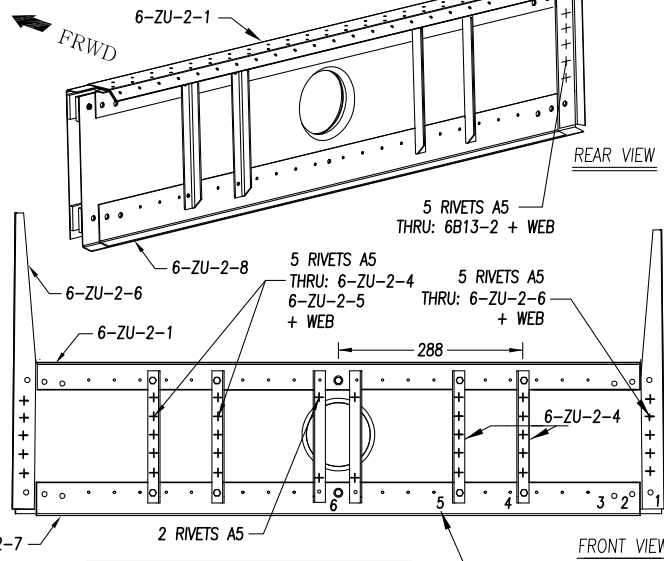
OR EQUIVALENT TO  
160 TO 180 KPSI

### 6-ZU-2-3

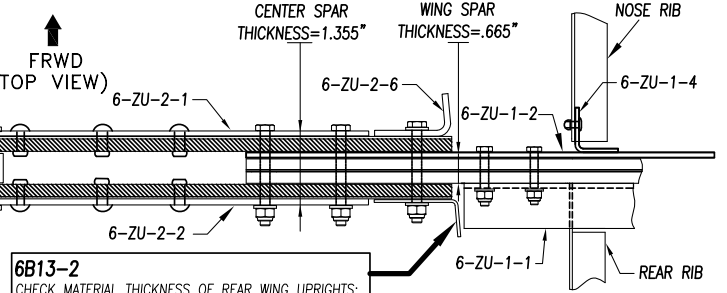
FIRST SOLID RIVET 6-ZU-2-7 AND 6-ZU-2-8 TO CAPS, ADD A FLAT PENNY WASHER AN970-4 ON EACH SIDE OF EXISTING SPACERS 6W4-5 ADD WEB SPACER 6-ZU-2-3. AND RE-ASSEMBLE WITH LONGER BOLTS.

### 6-ZU-2-6

REPLACE FRONT UPRIGHT. DRILL NEW HOLES IN FUSELAGE SIDE SKIN INTO UPRIGHT DOUBLER 6-ZU-3-5 (IGNORE EXISTING HOLES).



### CENTER SPAR + WING



6B13-2  
CHECK MATERIAL THICKNESS OF REAR WING UPRIGHTS:  
IF t=.040" REPLACE WITH t=.063"

### 6-ZU-2-1

DRILL OUT SOLID RIVETS ADD DOUBLER ON TOP OF SPAR. RE-ASSEMBLE WITH SOLID RIVETS.  
MS20470AD-5-10

### 6-ZU-2-4

UPRIGHTS OVERLAP ON TOP OF DOUBLERS INSTALLED WITH BOLTS THRU SPACER 6-ZU-2-3 RE-INSTALL UPRIGHTS 6W4-4 WITH SOLID RIVETS MS20470AD-5-11

### 6-ZU-2-5

ADD A SHIM BETWEEN WEB AND UPRIGHT. TRIM LENGTH TO FIT BETWEEN TOP DOUBLER AND BOTTOM ANGLE. RIVET UPRIGHT TO WEB.

### 6-ZU-2-7

DRILL OUT SOLID RIVETS. OVERLAP ANGLE ON FRONT SIDE OF WEB AND FLANGE. SOLID RIVET SPAR ASSEMBLY.

### 6-ZU-2-2

DRILL OUT SOLID RIVETS ADD DOUBLER ON BACK SIDE IN TOP CORNER. ASSEMBLE WITH SOLID RIVETS.

### 6-ZU-2-8

DRILL OUT SOLID RIVETS ADD ANGLE ON TOP OF WEB AND BOTTOM FLANGE. SOLID RIVET SPAR ASSEMBLY.

### 6-ZU-2-9

OVERLAP ON OUTSIDE OF FUSELAGE. REAR RIVET LINE THRU EXISTING HOLES NEW RIVET LINE THRU 6-ZU-2-7. ADD FRONT RIVET LINE

ZODIAC  
CH 601 XL / 650

UPGRADE DRAWINGS  
CENTER SPAR SECTION

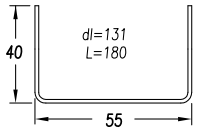
6-ZU-2

Copyright© 2009 CHRIS HEINTZ

DATE: 25 JAN 2010

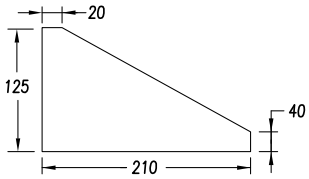
**6-ZU-3-4**

REPLACE L ANGLES ALONG SIDES OF ACCESS HOLE IN SEAT PANEL 6B15-4 WITH LONGER ANGLES 6-ZU-3-4 ALSO ADD AN ANGLE 6-ZU-3-4 IN CORNER OF SEAT PANEL AND ARM REST SIDE 6B18-1



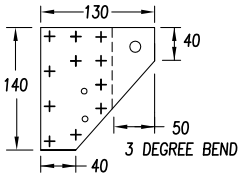
**1 BELLCRANK SUPPORT CHANNEL**

t=.040" 6061-T6 (2 REQ'D)



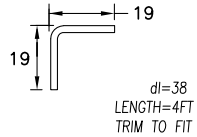
**2 SIDE DOUBLER**

t=.063" 6061-T6 (2 REQ'D)



**3 ATTACH PLATE**

t=.125" 6061-T6 (1L + 1R REQ'D)

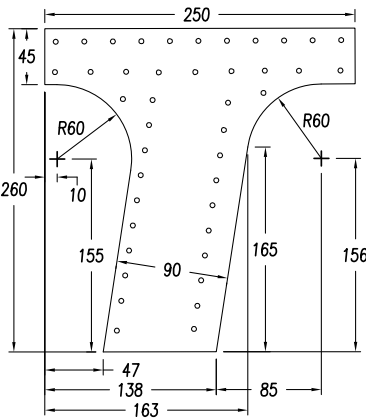


**4 SEAT ANGLES**

t=.040" 6061-T6 (3 REQ'D)

**5 UPRIGHT DOUBLER**

t=.032" 6061-T6 (2 REQ'D)  
650 USE 65-ZU-3-5



**6-ZU-3-3**

XL ONLY - REPLACE REAR WING ATTACH PLATE 6B5-4 WITH THICKER MATERIAL 6-ZU-3-3

**6-ZU-3-5**

UPRIGHT DOUBLER OVERLAPS ON OUTSIDE OF FUSELAGE SIDE SKINS. AFT RIVET LINE THRU EXISTING UPRIGHT 6B13-2, FRONT RIVET LINE THRU 6-ZU-2-6

11 RIVETS A5 THRU LONGERON

6-ZU-3-5

A5 PITCH 20

3 + 1 RIVETS A5

6-ZU-3-4

6-ZU-3-2

Z ANGLE

ADD DIAGONAL STANDARD Z ANGLE TO FUSELAGE SIDE SKIN - FROM FRONT BOTTOM OF SPAR TO TOP CORNER OF VERTICAL L ANGLE AND LONGERON.

L ANGLES, QTY=4

ADD L ANGLES BETWEEN REAR RIBS. ENDS RIVETED TO FLANGES OF BELLCRANK CHANNEL 6-ZU-3-1 RIVETED TO TOP AND BOTTOM SKINS. VIEW FRONT TOP OF RIGHT WING

**6-ZU-3-2**

ADD FUSELAGE SIDE DOUBLER OVERLAPS OUTBOARD FLANGE OF GUSSET 6B10-4 RE-USE AN3-5A WITH 1 WASHER REF. DRAWING 6-B-14

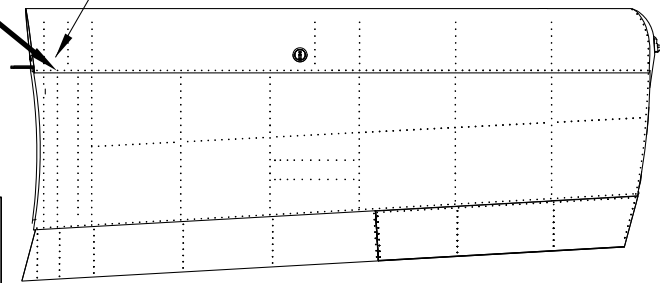
A5 RIVETS THRU EXISTING HOLES PITCH 20 ALONG TOP AND BACK

**SPAR RIVET LINE**

DOUBLE UP RIVET LINE THRU SPAR EXTRUSION [TOP] AND SPAR ANGLE [BOTTOM] UP TO RR # 5

A5 PITCH 20

A5 PITCH 20 IN BOTTOM ANGLE 6-ZU-1-5



A4 PITCH 40  
L ANGLES  
WING SKINS:  
6W8-3  
AND 6W8-2

2 RIVETS A5  
END OF L ANGLES  
TO 6-ZU-3-1

**6-ZU-3-1**

REPLACE BELLCRANK SUPPORT CHANNEL 6W6-10 BY 6-ZU-3-1 REINSTALL BELLCRANK SUPPORT 6W6-11 PER DRAWINGS 6-W-6

A5 RIVETS THRU EXISTING HOLES

ZODIAC  
CH 601 XL / 650

UPGRADE DRAWINGS  
BELLCRANK CHANNEL - DOUBLERS

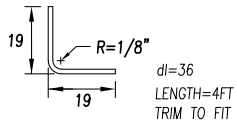
6-ZU-3

Copyright© 2009 CHRIS HEINTZ

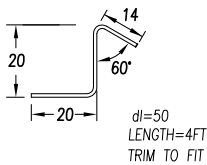
DATE: 25 JAN 2010

**AILERON MASS BALANCE**

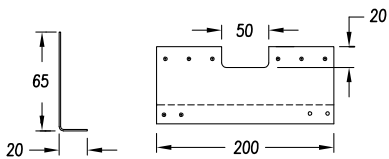
BALANCED AILERON see LAA/MOD/162B/004  
 INSTALL BALANCE ARM TO AILERON RIBS  
 WITH AN3-11A BOLTS AND AN365-1032 NUTS  
 AILERON MASS BALANCE ALSO TO BE INSTALLED ON  
 AILERONS WITH FLEX HINGE 6W2-3



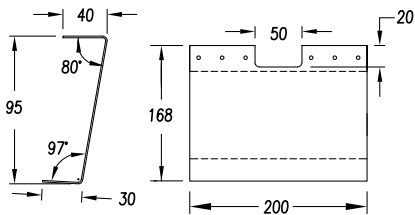
**STANDARD L ANGLE**  
 t=.025" 6061-T6 (16 REQ'D)



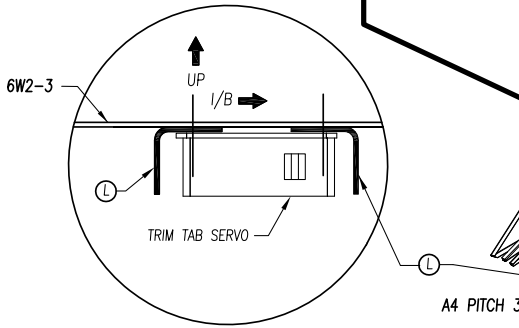
**STANDARD Z ANGLE**  
 t=.025" 6061-T6 (1 REQ'D)



**AILERON CONTROL STOP**  
 t=.040" 6061-T6 (1 REQ'D)



**AILERON STOP SUPPORT**  
 t=.040" 6061-T6 (1 REQ'D)



**L ANGLES - AILERON TRIM SERVO**

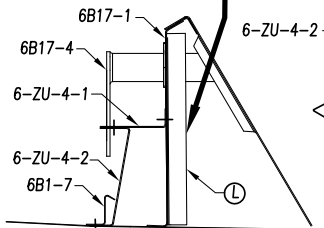
REF. AILERON TRIM TAB OPTION 6-ATO-1  
 ADD L ANGLES BETWEEN SERVO AND  
 AILERON SKIN 6W2-3 OR 6-PH-1-1  
 LENGTH=265

**6-ZU-4-1**

AILERON CONTROL STOP.  
 FILE CUTOUT TO INCREASE DEFLECTION  
 AS NECESSARY.

**L ANGLE 6B17-1**

ADD AN L ANGLE TO SIDES OF  
 REAR TORQUE TUBE BEARING  
 SUPPORT 6B17-1



**AILERON GUSSETS**

GUSSETS BETWEEN SKIN AND RIB  
 65W2-5 AILERON RIB #2 GUSSET  
 65W2-6 AILERON RIB #1 GUSSET

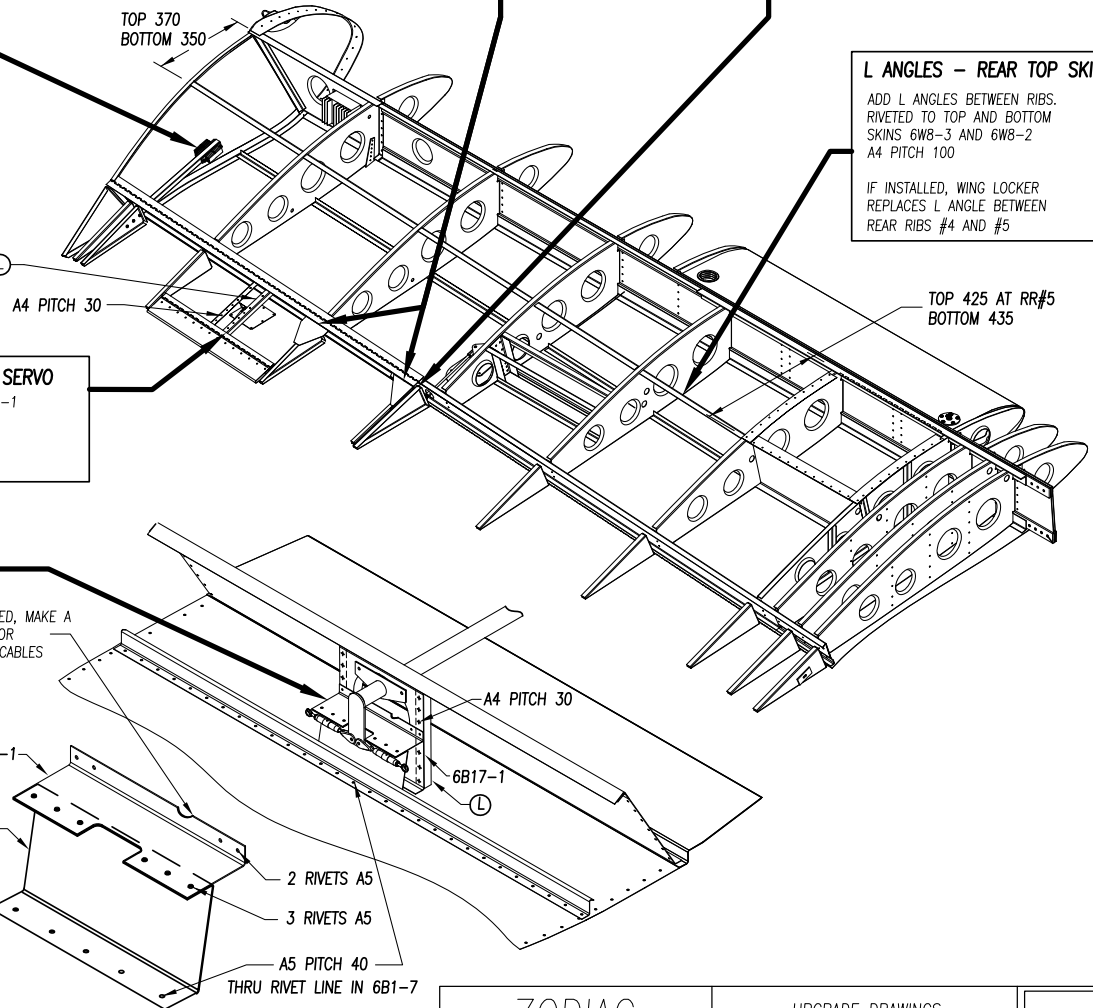
**6-S-3-1 FLAP STOP**

ELECTRIC FLAP ACTUATOR DRAWS FLAPS UP AGAINST  
 FLAP STOPS AND SHUTS OFF AUTOMATICALLY WITH  
 FLAPS UNDER LOAD. WHEN ONE FLAP IS COMPRESSED  
 AGAINST ITS FLAP STOP, CHECK THAT OTHER FLAP IS  
 ALSO PUSHED FIRMLY AGAINST ITS STOP.  
 REPLACE ONE STOP IF NECESSARY.

**L ANGLES - REAR TOP SKIN.**

ADD L ANGLES BETWEEN RIBS.  
 RIVETED TO TOP AND BOTTOM  
 SKINS 6W8-3 AND 6W8-2  
 A4 PITCH 100

IF INSTALLED, WING LOCKER  
 REPLACES L ANGLE BETWEEN  
 REAR RIBS #4 AND #5



ZODIAC  
 CH 601 XL / 650

UPGRADE DRAWINGS  
 CONTROL STOPS - SERVO L ANGLES

6-ZU-4

