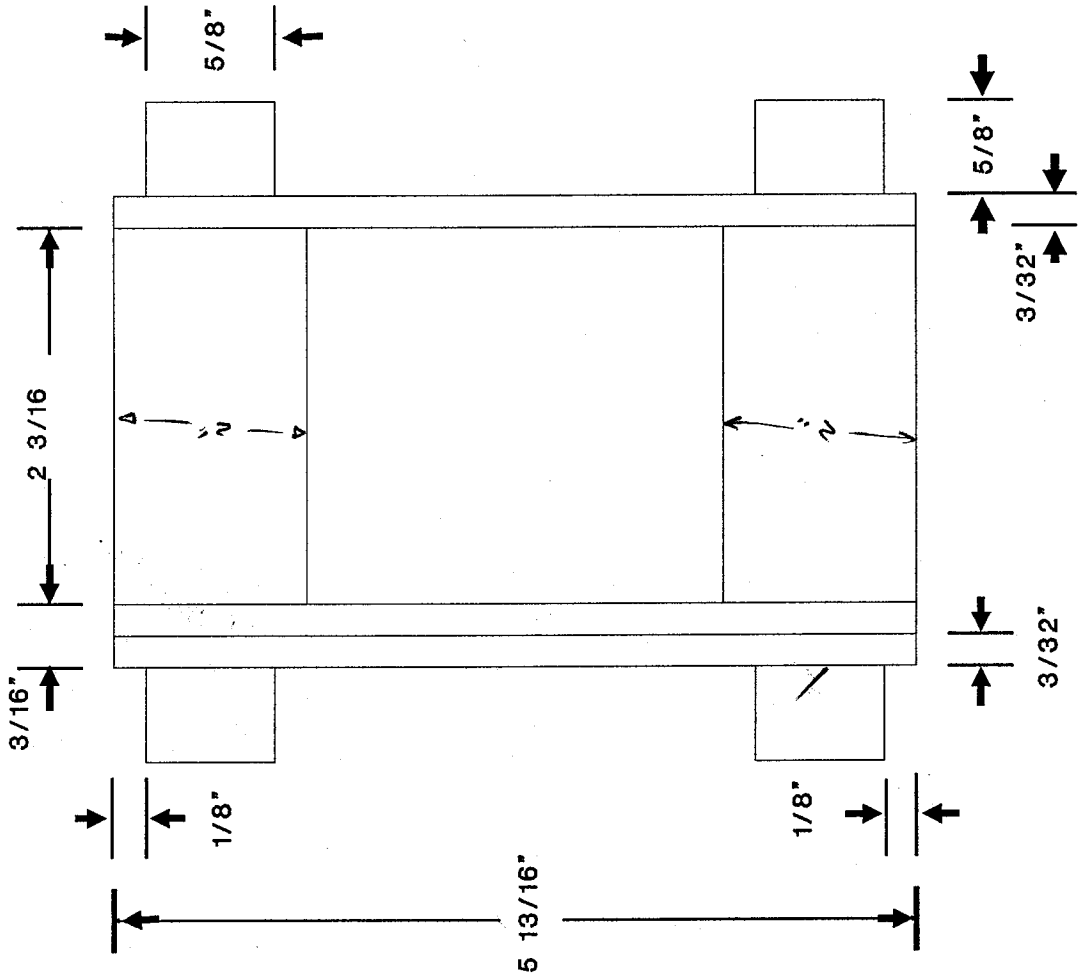


# KR-M MAIN SPAR DESIGN

SKETCH ONLY - NOT TO SCALE



COMPARATIVE ANALYSIS "KR-M" TO KR-2 MAIN SPAR DESIGN

R. MARSH 8/13/90

| KR-M DATA: |           | KR-M            |            | KR-2<br>(REFERENCE DATA) |  | KR-2 DATA:        |               |
|------------|-----------|-----------------|------------|--------------------------|--|-------------------|---------------|
| SPAR HT    | 5.8125 in |                 |            |                          |  | SPAR HT           | 7.1875 in     |
| UPPER FLG  |           |                 |            | 9463                     |  | UPPER FLG         |               |
| ht         | 2.1875 in | BENDING STRESS: | 9365.60410 |                          |  | ht                | 2.1875 in     |
| wd         | 2 in      | (psi)           |            |                          |  | wd                | 2 in          |
| LOWER FLG  |           |                 |            | 9463                     |  | LOWER FLG         |               |
| ht         | 2.1875 in | BENDING STRESS: | 9365.60410 |                          |  | ht                | 2.1875 in     |
| wd         | 2 in      | (psi)           |            |                          |  | wd                | 2 in          |
| EARS       |           | BENDING STRESS: |            |                          |  | EARS              |               |
| UPPER      |           | (psi)           |            |                          |  | ht                | 0 in          |
| LOWER      |           |                 |            |                          |  | wd                | 0 in          |
| 0.625      | 0.625     |                 |            |                          |  | dist below cap    | 0 in          |
| 0.625      | 0.625     | SHEAR LOAD:     | 2952.33151 | 3508                     |  | WEB (A) thickness | 3/32 0-125 in |
| 0.125      | 0.125     | (lbs)           |            |                          |  | WEB (B) thickness | 3/32 0-125 in |
| 0.1875 in  |           |                 |            |                          |  | DIAPHRAM SPACE    | 9 in          |
| 0.09375 in |           | BNDG MOMT:      | 149562     | 168462                   |  | "G" LOAD          | 7 g           |
|            |           | (in-lbs)        |            |                          |  | SPAN              | 20.66 ft      |
| 6 in       |           |                 |            |                          |  |                   |               |
| 7 g        |           | ALLOWABLE G:(+) | 7.07279522 |                          |  |                   |               |
| 18.66 ft   |           | (-)             | 7.07279522 |                          |  |                   |               |
| 0.625 in   |           |                 |            |                          |  |                   |               |

**"KR-M" MAIN SPAR**  
6.0" SPAR HEIGHT

| COMPARATIVE ANALYSIS "KR-M" TO KR-2 MAIN SPAR DESIGN |             |            | R. MARSH 8/17/90  |
|--|-------------|------------|-------------------|
| KR-M DATA:   |             | KR-M       | KR-2              |
| KR-M DATA:   |             | KR-2 DATA: |                   |
| SPAR HT  | 6 in        |            | SPAR HT           |
| UPPER FLANGE   |             |            | UPPER FLG         |
| ht   | 2 in        | 8852.23233 | ht                |
| wd   | 2.15625 in  |            | wd                |
| LOWER FLANGE   |             |            | LOWER FLG         |
| ht   | 2 in        | 8852.23233 | ht                |
| wd   | 2.15625 in  |            | wd                |
| EARS   | UPPER LOWER |            | EARS              |
| ht   | 0.625 0.625 |            | ht                |
| wd   | 0.5 0.5     |            | wd                |
| dist below cap                                       | 0.125 0.125 |            | dist below cap    |
| WEB (A) thickness                                    | 0.1875 in   | 2819.06131 | WEB (A) thickness |
| WEB (B) thickness                                    | 0.09375 in  |            | WEB (B) thickness |
| DIAPHRAM SPACE                                       |             |            | DIAPHRAM SPACE    |
| "G" LOAD   | 9 in        | 149562     | "G" LOAD          |
| SPAN   | 7 g         |            | SPAN              |
| DIAPHRAM (width)                                     | 18.66 ft    |            |                   |
|  | 0.625 in    |            |                   |
| BENDING STRESS:                                      |             |            |                   |
| UPPER FLANGE (psi)                                   |             |            |                   |
| BENDING STRESS:                                      |             |            |                   |
| LOWER FLANGE (psi)                                   |             |            |                   |
| SHEAR LOAD:  |             |            |                   |
| MAX (lbs)  |             |            |                   |
| BENDINGG MOMT:                                       |             |            |                   |
| (in-lbs)   |             |            |                   |
| ALLOWABLE G: (+)                                     |             |            |                   |
| (-)  |             |            |                   |

**"KR-M" AFT SPAR**  
3 5/16" SPAR HEIGHT

| KR-M DATA:        |             | KR-M               |                | KR-2  |  | KR-2 DATA:        |            |
|-------------------|-------------|--------------------|----------------|-------|--|-------------------|------------|
| SPAR HT           | 3.3125 in   |                    |                |       |  | SPAR HT           | 3.94 in    |
| UPPER FLANGE      |             |                    |                |       |  | UPPER FLG         |            |
| ht                | 0.9375 in   | BENDING STRESS:    | 5520.82931     | 5659  |  | ht                | 0.9375 in  |
| wd                | 1.125 in    | UPPER FLANGE (psi) |                |       |  | wd                | 1.125 in   |
| LOWER FLANGE      |             | BENDING STRESS:    | 5475.92199     | 5659  |  | LOWER FLG         |            |
| ht                | 0.9375 in   | LOWER FLANGE (psi) |                |       |  | ht                | 0.9375 in  |
| wd                | 1.125 in    |                    |                |       |  | wd                | 1.125 in   |
| EARS              | UPPER LOWER |                    |                |       |  | EARS              |            |
| ht                | 0.625 0.625 |                    |                |       |  | ht                | 0 in       |
| wd                | 0.125 0.125 |                    |                |       |  | wd                | 0 in       |
| dist below cap    | 0.125 0     | SHEAR LOAD:        | 5505.01618     | 6621  |  | dist below cap    | 0 in       |
| WEB (A) thickness | 0.09375 in  | MAX (lbs)          |                |       |  | WEB (A) thickness | 0.09375 in |
| WEB (B) thickness | 0.1875 in   |                    |                |       |  | WEB (B) thickness | 0.09375 in |
| DIAPHRAM SPACE    | 9 in        | BENDINGG MOMT:     | 14956.2        | 16846 |  | DIAPHRAM SPACE    | 9 in       |
| "G" LOAD          | 7 g         | (in-lbs)           |                |       |  | "G" LOAD          | 7 g        |
| SPAN              | 18.66 ft    |                    |                |       |  | SPAN              | 20.66 ft   |
| DIAPHRAM (width)  | 0.625 in    | ALLOWABLE G:       | (+) 7.17519012 |       |  |                   |            |
|                   |             |                    | (-) 7.23403292 |       |  |                   |            |

COMPARATIVE ANALYSIS "KR-M" TO KR-2 AFT SPAR DESIGN

R. MARSH 8/17/90

**ASSUMPTIONS:**

1. Load on aft spar is assumed at 1/10 the load of the main spar FOR COMPARATIVE PURPOSES ONLY.

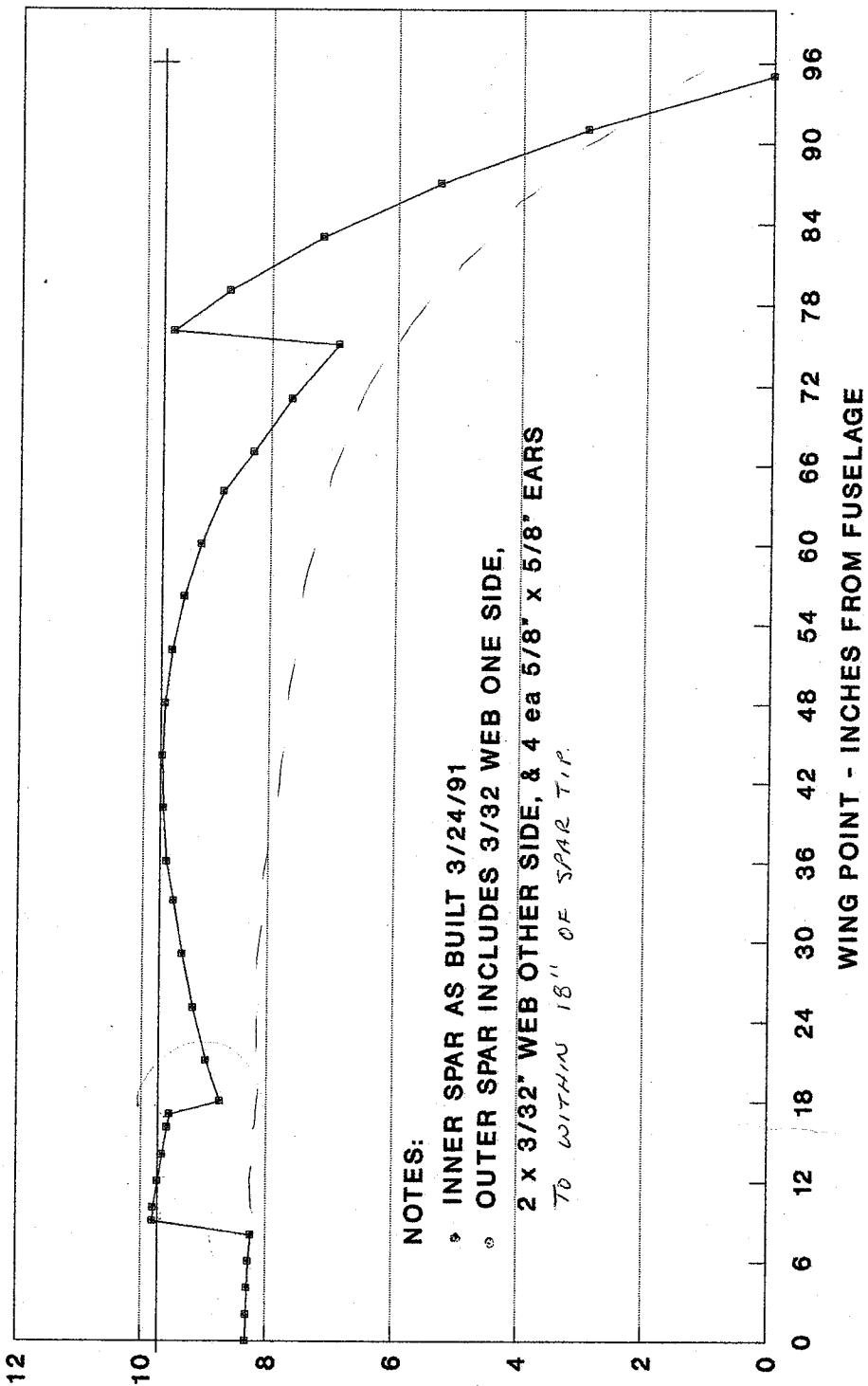
**RECOMMENDATIONS:**

1. The aft wing spar should be symmetrical as loads, although primarily positive "g" in normal flight, require the aft spar to support torsional loads on the wing including any potential flutter.
2. Recommended design is "build to spec" design and ADD ONE 3/32" web doubler and ONE 5/8" X 1/2" "EAR" both top and bottom.

STRESS

# SPANWISE SHEAR LOADING - KRM

SHEAR LOAD - PSI (Thousands)



NOTES:

- INNER SPAR AS BUILT 3/24/91
- OUTER SPAR INCLUDES 3/32 WEB ONE SIDE,  
2 x 3/32" WEB OTHER SIDE, & 4 ea 5/8" x 5/8" EARS  
TO WITHIN 18" OF SPAR TIP.

—■— KRM SHEAR —+— 6 'G' LIMIT

KRMSHEAR

3/26/91