# REVISION LIST

## CHAPTER 7: AIRCRAFT ALIGNMENT JIG

The following list of revisions will allow you to update the Legacy construction manual chapter listed above.

Under the “Action” column, “R&R” directs you to remove and replace the pages affected by the revision. “Add” directs you to insert the pages shows and “R” to remove the pages.

<table>
<thead>
<tr>
<th>PAGE(S) AFFECTED</th>
<th>REVISION # &amp; DATE</th>
<th>ACTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-1 through 7-12</td>
<td>0/02-15-02</td>
<td>None</td>
<td>Current revision is correct</td>
</tr>
<tr>
<td>7-1</td>
<td>3/12-15-04</td>
<td>R&amp;R</td>
<td>Updated table of contents with page numbers.</td>
</tr>
</tbody>
</table>
Chapter 7: Aircraft Alignment Jig

1. INTRODUCTION

The Aircraft alignment jig aligns the wings to the fuselage to the horizontal to the vertical. The jig is used in the subsequent chapters during the installation of these parts.

2. PARTS LIST

<table>
<thead>
<tr>
<th>#</th>
<th>PART NO. (P/N)</th>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>OPTIONAL ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(not included with kit)</td>
<td></td>
</tr>
<tr>
<td>WING JIG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1)</td>
<td>BP-4423</td>
<td>2</td>
<td>Blueprint, WS 46.16 Cradle</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>BP-4424</td>
<td>2</td>
<td>Blueprint, WS 137.2 Cradle</td>
<td></td>
</tr>
<tr>
<td>AFT FUSELAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1)</td>
<td>BP-4415</td>
<td>1</td>
<td>Blueprint, Aft Fuselage Cradle</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>BP-4421</td>
<td>2</td>
<td>Blueprint, BL 21 H. Stab. Cradle</td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>N/A</td>
<td>2</td>
<td>Aft Fuselage Cradle Mounting Plates</td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>AN3-5A</td>
<td>6</td>
<td>Bolts, Undrilled</td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td>AN365-1032A</td>
<td>6</td>
<td>Nut, Nylock</td>
<td></td>
</tr>
<tr>
<td>6)</td>
<td>AN960-10</td>
<td>6</td>
<td>Washers, Flat</td>
<td></td>
</tr>
<tr>
<td>VERTICAL TAIL SUPPORTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1)</td>
<td>BP-4416-01</td>
<td>1</td>
<td>Blueprint, Top Vertical Cradle</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>BP-4416-02</td>
<td>1</td>
<td>Blueprint, Lower Vertical Cradle</td>
<td></td>
</tr>
</tbody>
</table>

Supplies List

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/R</td>
<td>Wood</td>
</tr>
<tr>
<td>A/R</td>
<td>Wood Screws</td>
</tr>
</tbody>
</table>

Note:
Optional Parts available through:
(*) Lancair Avionics
(**) Kit Components, Inc.
A few important notes before getting started:

1. The 137.2 cradle supports are used for closing the wings only. If you have been to the builders assist program you don’t need to build this support.
2. You don’t need to build the aft alignment jig until you start chapter 11. However if you have the room, we suggest you set it all up now.
3. The purpose of this chapter is to get the alignment jig ready for the next chapters. Some of the final alignments to the jig will be completed in the later chapters. The text will specifically state which alignments are finalized later.
3. CONSTRUCTION PROCEDURES

A. Wing Jig

Prior to setting up the aircraft alignment jig it is wise to consider space requirements. Note the additional space required to remove the wings. Leave sufficient room to walk around all parts. Also consider the additional room required if you choose to install firewall forward in the jig. Study the figure to determine space requirements.

Note: To remove the wing you need 4 extra feet of room beyond the wing tip.

In Case You Wonder...

The 45.7 and 136.5 are equivalent butt line locations for WS 46.16 and 137.2. We have also accounted for the cradle thickness. See chapter 1 for explanations on WS vs BL.
There are a total of four (4) supports for the wing, 2 at the WS 46.16 and 2 at WS 137.2. Note that there are 2 sets of dimensions given: one for the WS 46.16 support and one for the WS 137.2 support.

Wing Jig Supports
Fig 7:A:3

Cut 2 pieces from 3/4” plywood or particle board.

Make from 3/4” plywood.

WS 46.16: 25.5 in.
WS 137.2: 35.5 in.

WS 46.16: 48.0 in.
WS 137.2: 40.0 in.

WS 46.16: 40.0 in.
WS 137.2: 32.0 in.

17.0 in. long w/ 45° cut on both ends.

Important: Tilt the 3/4” plywood to 3.7° off vertical or 86.3° off horizontal.

Secure with a sufficient number of wood screws.

Cut 2 pieces from 3/4” plywood or particle board.

137.2 Cradle

46.16 Cradle
Align Left 46.16 Cradle

Fig. 7:A:4

It is easiest to start by setting one of the 46.16 cradles. All the other cradles will be aligned to this one. So let’s start with the left 46.16 cradle.

46.16 Alignment:

1. Start by setting the cradle to \(+1.2° \pm .1°\). This is the wing incidence. (This means leading edge up.)

2. Align the cradle to the 46.16 reference line. Plumb bob off the inboard face of the cradle as shown.

3. Align the cradle to the cradle reference line.

4. Check that the cradle is set to 86.3° (± 0.2°)

(Suggested Height)
You may alter the working height but keep in mind all other dimensions of jig must change accordingly. 32 1/2” is close to minimum height for setting landing gear (see figure 3:F:6).
The remainder of the wing cradles are set in similar manner using the 41.16 left cradle as reference.

![Diagram of wing alignment process]

**Alignment Criteria**

1. Set all cradles to 1.2° (± 0.1°).
2. Align the cradles to their respective WS reference lines.
3. Align all cradles to the cradle reference line.
4. Set the 137.2 cradles 5 7/8" above the 46.16 cradle.
5. Align to the right 46.16 cradle to the left as shown.

For better accuracy use the same location on all cradles when leveling.

**Suggested method for initial alignment:**

Slots with bolts and wing nuts for easy adjustments. Once set, use wood screws to secure the cradle directly to the support.

Check alignment of all cradles again, Bondo feet in place. Secure cradles using a sufficient amount of screws. At this point you can check how the wing fits the jig. A small amount of weight may be necessary for the wing to conform to the jig.

It is acceptable to make minor adjustments:

1. **You can** make minor adjustments to 137.2 in the fore/aft direction if necessary.
2. **You can** make minor adjustments to 137.2 in the up/down direction if necessary.
3. **You can not** alter the incidence of 1.2°!
B. Aft Fuselage Jig

Aft Fuselage Jig Table

Fig 7:B:1

Aft Fuselage Jig Table Alignment Marks

Fig. 7:B:2

Aircraft Centerline

Add 2" x 4" supports as shown

Cradle Alignment Line

Align the outboard face of the 30" x 2" x 4" to the reference line.

Align aft face of 6" x 2" x 4" to the line.

A/C Fwd

3/4" ply wood or particle board

Each leg is 37" long

Brace the legs as shown.

Brace table with 2" x 4".

3/4" ply wood or particle board

A/C Fwd

8"

4"

3/4" ply wood or particle board

197/8"

197/8"

6"

A/C Fwd

Each leg is 37" long

Brace the legs as shown.

Brace table with 2" x 4".

A/C Fwd

Aircraft Centerline

Add 2" x 4" supports as shown

Cradle Alignment Line

Align the outboard face of the 30" x 2" x 4" to the reference line.

Align aft face of 6" x 2" x 4" to the line.
Aft Fuselage Jig
Fig. 7:B:3

- Separate piece makes it easier to remove aircraft from jig.
- Cut Out
- Aft fuselage Cradle
  Make From 3/4" plywood using BP-4415
- Level line
  Aligns to the a/c center line
- Aft fuselage Cradle Mounting Plates
- Bolt AN3-5A (6 pcs)
- Cut
- 1/8" Thick Aluminum plates (3" x 2.5") 2 pcs.
- Nylock Nut AN365-1032A (5 pcs)
- Washer AN960-10 (6 pcs)

Note: The horizontal cradles are approximately aligned in section C and final aligned in chapter 12. You can use the cradles of your horizontal jig or make new ones from blueprint.
To Align the Aft Fuselage Jig Table:

2. Plumb bob table to aircraft center line.
3. The table should be approximate level (within 3/16" end to the end and front to aft).
4. Bondo legs in place.
Initially align the aft cradles as shown. The final alignment is done with the entire aircraft on the jig. (For the purpose of completing chapter 8 you don’t need the aft fuselage jig).

1. Align the cradle to the center reference line.

2. The cradle must be set to -0.5°. This is the incidence of the tail. (This means nose down)

3. Initially set the horizontal cradle 26 1/4" above the reference point. Level the other horizontal cradle to the one you just aligned (doesn’t matter which one you align first).

4. The aft fuselage cradle is initially set to 9 5/16" above the reference point.

Fig. 7:B:5

Horizontal Cradle Alignment
C. **Vertical Tail Supports**

The vertical tail support is used for closing the vertical. It is final aligned and used in chapter 13.

**Vertical Tail Support**  
Fig. 7:C:1

- Transfer this level line to the 10'x2"x4" using a water level.
- The 2" x 4" must be vertical.
- Secure with wood screws.

![Diagram of vertical tail support](image-url)
Align the cradles as necessary to fit the vertical. It is acceptable to move the cradles up/down and aft/fore as necessary to get a good fit.

Plumb bob the front and aft of the cradle at the split line (where the left and right of the cradles contact) onto the centerline of the aircraft. This ensures that there will be no twist in the vertical tail.

Make cradles out of 1/2" plywood or particle board using blueprint BP-4416-01 and BP-4416-02.