Notes:
CA-25 APPR BOOK II on front of book.

Blank pages: 1-9, 160-300, inside back cover.

- Each page has 1 graph glued to it: 43, 45, 49, 57, 65, 77, 87, 93, 102, 104, 110, 113, 119, 121, 130.

Scanned by:
Sheila Finch
RSICC / Oak Ridge National Lab.
July 29, 1999
This notebook is assigned to personnel performing research and development work and must be used for all original calculations, notes, and abstracts from reports.

Assignee is responsible for the safeguarding of this notebook in accordance with security regulations.

This notebook must be returned to issuing office when completed or upon termination of assignee.

Every page or entry must bear a date and the signature of the person who made the entry.

Entries should be made in ink whenever it is reasonably so to do so.

Alteration or amplification of entries made on previous dates should be made as separate entries under their own dates and cross referenced to the previous entries.

Charts, drawings and graphs drawn on special paper should be glued or otherwise securely fastened in place and should individually bear a date and signature. Do not obscure any information.

The notebook should be periodically reviewed by one or more independent persons in the department and should be signed and dated by them. Likewise, they should make a statement that they have "read and understood the foregoing material." Witnessing quills for this purpose are available in your department's office.

It is advisable to prepare a neat record of each item, such as a heat treatment, process or reaction, etc., with a very brief description of the purpose, objective or approach.

Description of the invention or discovery should be complete enough to be understood by anyone skilled in the art.

Reference to name or catalogue number should be made when standard items are being discussed, i.e., Wendlinghouse pump.

In cases where work is conducted in cooperation with others, it is often necessary to meet with them from time to time and discuss new developments. The occurrences of such conferences should always be entered in your notebook regardless of recording elsewhere, giving the date, who was present (if possible), and an outline of the subjects discussed. This will establish error in occasional claims of other parties that you have appropriated information from them revealed during an interview, and thus provide you with patent protection.
Loading exactly the same as 9-28 (5, p. 718):

Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Series 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Box 1 -1.9 12-23 6-9 red 12-23

All Anee eccentric rods in full without fuel attached on bottom.

Anee central rod & fuel section attached on bottom.

Log N has been recalibrated.

Critical Conditions:

Temp. 73°F

DC-3 68 (10 x 20)

Height 104.3

Log N 0.18

Blade 16.02

Red 29.02

Eccentric Rod 0.01

Control Rod 24.15
Loading - same as 9-39 except slot 17, box 7
now contains 11-7 instead of 4-20.

Didn't go critical.

Water up

Red + Black out.

---

<table>
<thead>
<tr>
<th>Rod</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade</td>
<td>13.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC-3</th>
<th>6.9 (10-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPN</td>
<td>1.18</td>
</tr>
<tr>
<td>Temp</td>
<td>73°F</td>
</tr>
</tbody>
</table>

\[ \text{Value of 6 half plate period in slot 17 at } \frac{3}{2} = 0.0498 \frac{1}{2} \]
START-UP CHECK LIST
Equiptmnt Checked by: A. B. Personnel Check by: C. W. M. A. B.
Instrument and Safety Check by: A. B. Personnel Check by: C. W. M. A. B.
"Screw In" Check by: M. A. B. Personnel Check by: C. W. M. A. B.
Emergency Equipment in Control Room checked by: A. B. Personnel Check by: C. W. M. A. B.
Red Light Ship by: A. B. Personnel Check by: C. W. M. A. B.
Start-Up OK by: A. B. Personnel Check by: C. W. M. A. B.

Loading: 9.742 9.742

4 Half plates exchanged for 4 full plates in box 17.

Made Into 17. 518.32

(Added 2 again plates)

& the ending of 9.74.

Amended: 9.751 from box 17, added 2-14.

9.751 17

H 98 " 21 5.2 3-20

H 98 " 21 5.2 3-22

0.01 " 29.15

Central Plate 2.901

Water Temp 73 F
START-UP CHECK LIST

Equipment Checked by: T.R.P.  Possessed Check by: H.G.B.
Instrument and Safety Checked at 10:23 PM  Date: 11-22-1965
"Source 1" Checked by: R.S.  Source No.: 204
Emergency Equipment in Control Room Checked by: R.C.R.
Red Light on by: M.K.H.  Time: 11:10 AM  Date: 11-22-1965

Expo: 9-4-5  Time: 10:23 AM  Date: 11-22-1965

Personal: W.J.  C.R.  S.J.  F.R.

Loading: Same as 9-4-5  Date: 10-21/10-30  from 9-197

B  7 boxes 16 and 30.  

Critical Load:  

APP  Critical Load  

"  React.  Rod  

Control Blade  18.00  

"  Rod  

Sub Critical.

START-UP CHECK LIST

Equipment Checked by: H.G.B.  Possessed Check by: T.R.P.
Instrument and Safety Checked at 10:23 PM  Date: 11-22-1965
"Source 1" Checked by: R.S.  Source No.: 204
Emergency Equipment in Control Room Checked by: R.C.R.
Red Light on by: M.K.H.  Time: 11:10 AM  Date: 11-22-1965

Expo: 9-4-5  Time: 10:23 AM  Date: 11-22-1965

Personal: W.J.  C.R.  S.J.  F.R.

Loading: Same as 9-4-5  Date: 10-21/10-30  from 9-197

Critical Ambition:  

APP  Critical Load  

"  React.  Rod  

Critical Blade  

"  Rod  

Sub Critical.
START-UP CHECK LIST

1. Loading: Insert half plate in Box 30, Slot 17. (Continued)

2. Loading: Insert 5% plate in Slot 2.

3. Loading: Insert plate 5-16, Slot 2.

4. Loading: Insert plate 10-31, Slot 17. Assume this plate 10-31 sk...

5. Loading: Insert plate 5-16 in Slot 2.


Critical Core:

- Core 24.14
- Control Blanks 58.00
- Rod 29.02

- 2.37 x 2.57 = 17.94
- 36.8 - 18.8 = 18.0

Total Reactivity Difference between 5-16 + 10-31 and 2-16 + 8-38 is 17.94 for the 8 fuel plates.

- 2 x 10.0 = 20.0 in. 1 x 10.0 = 10.0
- 2 x 5.0 = 10.0 in. 1 x 5.0 = 5.0
- 2 x 4.0 = 8.0 in. 1 x 4.0 = 4.0
- 2 x 2.0 = 4.0 in. 1 x 2.0 = 2.0

Total: 8 fuel plates.
The previous red fuel plates are in error.

Start-up Check List

Equipment Checked by: D.M.
Instrument and Safety Checked and Listed by: A.M.
Source List Checked by: A.M.
Emergency Equipment in Control Room Checked by: A.M.

Cold-Down Critical Loading:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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<td>f</td>
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<td>f</td>
<td>f</td>
<td>f</td>
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</tbody>
</table>

Note:
- Box 11: Lot B contains 379, instead of half full.
- 2-41
- 4-20
- 6-26

All series of plates have been weighed.

End boxes on...
Summary of weighings:

<table>
<thead>
<tr>
<th>Series</th>
<th>Weight in H2O</th>
<th>Weight in dry</th>
<th>Total</th>
<th>Void volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20-55</td>
<td>805.6</td>
<td>767.6</td>
<td>421</td>
<td>78.6</td>
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<tr>
<td>11-23-55</td>
<td>787.5</td>
<td>619</td>
<td>116</td>
<td>623</td>
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<tr>
<td>11-23-55 (7-8)</td>
<td>800.1</td>
<td>619</td>
<td>116</td>
<td>623</td>
</tr>
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The following plates were opened to the gas source:

<table>
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<tr>
<th>Plate</th>
<th>1-7</th>
<th>2-2</th>
<th>3-7</th>
<th>4-7</th>
<th>5-10</th>
<th>5-11</th>
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<tbody>
<tr>
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<td>14</td>
<td>4</td>
<td>7</td>
<td>11</td>
<td>4</td>
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<tr>
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<td>2</td>
<td>4</td>
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<td>14</td>
<td>8</td>
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<td>18</td>
<td>15</td>
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<td>12</td>
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<tr>
<td>9</td>
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<td>15</td>
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<td>12</td>
<td>11</td>
<td>11</td>
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</table>

Fuel plate weight in H2O:

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<th>3-7</th>
<th>4-7</th>
<th>5-10</th>
<th>5-11</th>
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<td>15</td>
<td>10</td>
<td>12</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

Critical conditions:

- Water: 109.0 cm
- Red: 39.01 g
- DC: 3
- Vol: 17.72 in
- Temp: 72.5°F

Total void volume: 4187 cm³

Mass: 7.5 x 16.5 x 2 = 3375 / 2 = 1687.5 plates

Total mass: 1687.5 / 10.5 kg = 1635 kg


diameter = \( \frac{1635}{10.55} \)
START-UP CHECK-LIST

Equipment Checked by: J. L.  Personnel Check by: M. D.
Instrument and Safety Checked and Reported by: E. E. F.
Power Supplied by: S. H.  Source No.
Emergency Equipment and Oxygen Check by: D. A.
Red Lights On by: T. D.  AM
Start-Up OK'd by: J. L.  PM Date: 11-25

Start-up: Same as 7-13

Critical Cuts:
- Control Valve 0.15
- Leg N. 0.20
- Red 1
- Water 0.5
- Water Temp 72°F

Loading: Remote 0.778 (45) from Box 11 S. H. B. 8
3-91
4-20
6-90

(9 1/2 - 4 leaf plates)
<table>
<thead>
<tr>
<th>day</th>
<th>11-25</th>
<th>a</th>
<th>a+1</th>
<th>227</th>
<th>224</th>
<th>172</th>
<th>d</th>
<th>h</th>
<th>i</th>
<th>j</th>
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<td>154</td>
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<td>801</td>
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<td>746</td>
<td>140</td>
<td>317</td>
<td>613</td>
<td>1972.5</td>
<td>1750.0</td>
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<td>74.5</td>
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<td>66.5</td>
<td>8210</td>
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<td>8</td>
<td>70.5</td>
<td>8233</td>
<td>1459.5</td>
<td>237</td>
<td>809</td>
<td>1637.5</td>
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</tr>
</tbody>
</table>

Not quite critical: blade out, water up
Cut temp 720°F

Vad volume = 2247 - \frac{2247}{337.5} = 2220

Wt/hr = \frac{7.5 \times 45 - 2}{337.5 \times 2} = 335.5

= 10.48 kg
Loading: all boxes: (112 plates per box)

slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
+material 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

WPI Contact rod all the way out, very supercritical
With APPR control rod all the way in, water all the way up reactor sub-critical.

Core Build Out: Effective Rod 12.02 in.

C11 11.025 in. Water (62.7) - critical (approx)

10.84 in. 63.0 - critical (approx)
10.2 in. 63.8 - critical (approx)
9.80 in. 64.0 -
9.31 in. 64.9 -
8.70 in. 65.7 -
8.13 in. 67.0 -
7.72 in. 68.1 -
7.12 in. 70.1 -
6.51 in. 72.0 -
5.0 in. 76.0 -

All five APPR rods mounted: the control rods one at 12 inches above the core (Half-way in)

With some in, water at 18 cm, possible elected rod all the way in, reactor going on positive period. Much too super critical, loading.
Central 5.27 Water Height 80.1
4.03 83.6
4.48 30.0
4.28 88 (1.09)

START-UP CHECK LIST
Equipment Checked by MB
Instrument and Safety Checked by MB
Boiler Checked by MB
Emergency Equipment in Central Room Checked by MB
Red Light On by MB
Start-Up OK'd by MB
Time: 1100 Date: 11-27-1957

Logging: for all boxes except APPR red boxes:
Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Mixed 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

In APPR boxes are 1's, file above except slot 4 contains 1's.

Surface Out: Electric Red at 12.06 blue all the way in
Central Red at 13.55, Water Height at 70.8 in.
12.06 71.2
11.82 73.8
11.02 77.7
10.46 84.8
10.12 109.1 critical

Pulling Rate out: 28.20 in.
Central Red 9.5 in, Water Height 109.1 in critical
**Blade pulled all the out**

**Central** 11.05 in 109.3 supercritical

**Ecoa** 11.78

**Central** 11.03 in 109.3 subcritical

**Ecoa** 11.78

**Water** 109.3 11.97 in

**Blade** 20.09 in

**Temp. 73°F**

**Central** 11.05 in 109.3 11.97 in

**Ecoa** 11.78

**Water** 109.3 in

**Blade** 20.09 in

**Water Red** metal 11.06 in subcritical
The purpose of the run is to work with 9.5; to get the equipment running this configuration in order to complete landing of 9.1, 9.0, 9.2.

The earth conditions at 73°F, 70°F, 68°F, and 66°F. The earth condition is 71°F.

We 45; 105.7; 101.4; 11.67.

The earth condition is 71°F.

Weather at 9:42 a.m. (local reading at 11).

Sounded by plane multiplier (ground pressure 14.4). Soundings agree well with the observed level (2.9).

The earth multiplier using was at the usual 13.9-

but 11 was reading 12.9 in the observatory - agree.

The earth multiplier using was at the usual 13.9 - agree.
Location - Exactly the same as 8-27.

Fuel Location - Special plate F-2; top to bottom: slot 10, row 16.

B-24
B-29
B-131
B-42
B-63
B-75
B-47
B-146
B-18

HV on photo-multiplier turned down to 800 volts.

We power at 11:03:05 (Log No. 0.37)

Run conditions:

- Log No. 1.0
- Central APPR 11.875
- DC-2 700 (10x5)
- Escalator APPR 11.62
- R-1 5.3 (1000x100)
- Red 0.15
- Temp. 73°F
- Blue 6.99
- Height 108.9

Heavy minute exposure.

Register a proportional counter not operating properly.

Note: The special catcher foil plates are developing holes in the uranium foil due to water in the plates. No regular fluid plate has been torn apart, so we see if this condition is also occurring in it.

8:15 pm - start-up. Delayed by register on proportional counter. Replaced the register with a "dummy" one.

Photo-multiplier voltage turned down to 800 V.
foil location - top 6 bottom
plate F-2
 plate F-1

B-147
-100
-20
-46
-16
-26
-187
-186
-180

B-14 - 0.86 gm / plate

1/2 final power = 0.37 m log N

Run conditions:

Temp. 78.6°F
DC-2 65 (10 kg)
R-1 5 (1000000)
Log H 10

Height 109.7 cm.
Expr. 12-1  Time 5:05 AM Date 12-6 1965
Purpose: Rod Evaluation with Boron -
3 e g a 1 cent. rod in normal 25 x time.
Personnel:

INSTRUMENT CHECK

Date 12-6 10:55 Time 5:00 Source No. 25
Trip
Instrument Value Scale Source Distance Start-Up Scale
DC-1  
DC-2  
DC-3  
Log N  
R-1  
R-2  
F. M.  

START-UP CHECK LIST

Equipment Checked by Personnel Check by
Instrument and Safeties Checked and Reset by
"Source In" Checked by Source No.
Emergency Equipment in Control Room Checked by
Red Light On by Start-Up OK'd by

12:15 AM

Date 12-6 1965

Loading:
Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series 4 2 4 6 8 11 7 12 5 2 15 9 3 4 8 3 4

APPR rods: in position 9, 21, 23, 57; redaction not on
in position 25 rods. Section in core; Poison section not attached

* boron plates (Series β- boron) in slot 11 8-19

following bossa: 1, 3, 5, 6, 8, 10, 12, 30, 40, 41, 43, 45.
<table>
<thead>
<tr>
<th>Box</th>
<th>2-3</th>
<th>1.9</th>
<th>7.5</th>
<th>24</th>
<th>11-21</th>
<th>H-960</th>
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<td>2</td>
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<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>6</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>7</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>8</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>9</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>10</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>11</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>12</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>13</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>14</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>15</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>16</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>17</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>18</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>19</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>20</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
<tr>
<td>21</td>
<td>2-3</td>
<td>1.9</td>
<td>7.5</td>
<td>24</td>
<td>11-21</td>
<td>H-960</td>
</tr>
</tbody>
</table>

**Critical Conditions:**

- Water: 845 cm
- Air: 0.05
- Frosting: 0.00
- Control: 0.02
- Rod: 29015

**Dimensions:**

- Length: 1.5
- DC-3: 60 (10 x 10)

**Mass:**

\[ M_{\text{mass}} = 17.075 \text{ kg} \]
Loading: Find exactly the same as 13-1.
Boron: Not II contains boron throughout the reactor

Not critical.
Loading: Fuel exactly the same as 13-1.
Boron: slot 12 contains boron except for box 8.

3, 15, 17, 20, 23, 29, 31, 43. 8.8 in 4.0, 9.21, 7.7.
Actual count 8.2 in note =

Critical Conditions: 0.747 = 0.159

Height 10.95 cm
Log N 0.2
Appr. 0.6%

Blade pulled in 13.50 inches; positive period taken;
Scrammed on pelle multiplex (set at 900V)

Log N at ~ 10

Blade with 0.00 → 13.50" = 7.1 cents

$u^2 = 1.075 k^2$
Because of rod shielding blade, blade worth has decreased

Returned to Boxes 9, 21, 23, 325 as the 4 APPR rods

in by interchanging clay 25 and external APPR rod

Hence box 25 is in the 37 position in arad

heading:

Same as 13-3 with above box change.

[Executive rod that is not be toro attached, other rod has]

P.M. voltage decreased to 800V.

Critical Conditions:

- 4th APPR 00:00
  - With height 109.5 cm
- 5th APPR 4500
  - Temp. 720 F
- 4th Block 13:47
  - Log N 0.16
- Critical Test 5000 end
  - DC-3 74 x 10 x 10
Position period

Cut Blade @ 17.85 - 14.07 = 3.78"
16.5 sec period = 6.2 ft.

Levelled off with Cut Blade
29.02 → 12.46
6.56" → 6.2 ft

Black mark for 14.87 to 15.26

Mass 4" = 17.07 lb
5.4 lb

15 g in Cut Blade

Mass = 19.31 - .035 = 19.27
START-UP CHECK LIST

Equipment Checked by MB Personnel Check by DM
Instrument and Safeties Checked and Listed by DW
"Source In" Checked by DW Source No.
Emergency Equipment in Control Room Checked by AL
Red Light On by MB
Start-Up OK'd by DW Time 10-26-25 Date 12-6-1955

Loading-

Save 24 with the following changes:

Box 15 is now in position 17, 21, 25, 31, 29, 37, 31

Rod APPR poison in # 15, 17, 21, 25, 31

plate 1-16 is now in slot 11 of box 15
5-11-15 16
5-11-24 31
5-11-31 24
5-11-20 29
5-11-20 30

Subcritical - Full water height, blackout.

Mass U235 = 17.075 kg
Loading: some full loading in 13-2, together with the bare positions at 13-5.

Expt: 10, 12, 13, 16, 18, 28, 30, 33, 41, 43, 45.

Apart from cores containing 155 in slot 11; the rest contain boron series "C".

Subcritical
Loading: Same fuel loading as 13-1 together with the box change mentioned in 13-5.

Boron loading - listing is position 4: not box 4. Proper plate is in each box. Boron is in slot 11 in the following position. (the rest of positions, 55, is in slot 11):

1, 3, 5, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 41, 43, 45. (total 4.45)

Total mass B10 = 4.38 gm. (425 plates)
Total mass U25 = 17.075 Kg.

Critical Conditions:

<table>
<thead>
<tr>
<th>Temp.</th>
<th>71.26°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-B</td>
<td>69 (20 x 10)</td>
</tr>
<tr>
<td>Length</td>
<td>0.15</td>
</tr>
<tr>
<td>R-1</td>
<td>3.5B (100 x 100)</td>
</tr>
</tbody>
</table>

Control Rod: 29.01
Blade: 11.83

Rod positions: 15, 17, 23, 29: rods in full; no fuel attached position. 31: red will pull out; attached full out.
Plate pulled to $14.07$ & period measured.
Loading - exactly the same as 13-7 except the control rods in positions 31 & 23 have been physically interchanged.

Note: APPR rods in positions 15, 17, 29, 431 in full have no mud on bottom
APPR rod in position 228 completely out; mud action attached.

Not critical - water exp. fully out.

Log N 0.015
Loading:

- Plot: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- Series: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- Madrid: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

**Fuel Loading:** Complete loading at 9. (12.6 kg u²)

**Beam Loading:** Loading at 1/2 plate in all boxes except 3, 5, 7, 9, 11, 13, 14, 16, 17, 19 (6.56% B¹⁰)

**Note:** Fuel boxes are all in normal position except:

- Because of bad box, box 22 is replaced by box 9 in position 9, an APPR rod bottom a "dummy" rod are in watch. All fuel numbers correspond to their positions.

**Nabu too reactive:** Critical at 7 7/2 cm water height.
Loading exactly the same as 14-1 except slot 16 contains sewer fire fluid instead of sewer 9.

Still to radiate - water level n 88.7; critical.
Loading: exactly the same as 14-1 except slot 16.
In all boxes slot 16 now contains seven-five plates except in positions 7, 9, 11, 21, 23, 25, 55, 37, 43. In which slot 16 contains 5.5.

$U\text{ mass} = 11.75\times 10^{-2}$

$Boron = 6.56\ \text{gm Br}^{10}$

Temp. $72^\circ F$

Light $= 2.1$

Reactor sub-critical. Blade out, rod out, withdrawing.

We were slightly sub-critical. It is felt that the reactor would have been critical had we left in the last plates in 21-25. It is felt that
LOADING SAME AS 14-1 EXCEPT SLOT 16
SLOT 16 NOW CONTAINS SERIES 5 PLATE
EXCEPT BOXES 7, 9, 11, 23, 35, 37, 39
WHICH CONTAIN S.S.
U MASS 1178 Kg 10^3 g/m^3
B " 6.56 gm B^0 3.93 x 10^-18

TEMP 72 1178
20C N 0.11 0.11
WATER 1093 cm 1176 1176
D C3 69 x 10 x 10
CONTROL BLADE 14.45
ROD 29.01
NO APPR RODS
START-UP CHECK LIST

Equipment Checked by: R.D. Personnel Check by: J.L.
Instrument and Safeties Checked and Reset by: R.J.
Source In" Checked by: R.J. Source No.
Emergency Equipment in Control Room Checked by: M.B.
Red Light On by: M.B. Start-Up OK'd by: R.J. Time: 10:30 A.M. Date: 12-7-1965

Loading.

- Slot 12 contains 4.95 in boxes: 1, 3, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18.
- Slot 13 contains Series 5 and in boxes: 8, 10, 21, 23, 34, 38.

Total U mass = 11.27 kg U^{235} = 11.2915 g U^{235}
Total B mass = 4.26 gm B^{10} = 22.46 g of B^{10}

Not critical, cooler up, blitha rod out.

With source out, reactor going on soem period.
START-UP CHECKLIST

Equipment Checked by MB
Instrument and Safetin Checked and "Source In" Checked by RD
Emergency Equipment in Control Room Tested by UL
Red Light On by MB
Start-Up OK'd by RJ

Date 12-7-1965
Time 10:55

Loading - same as 14-5 except slot 16.

Slot 16 contains 5's in all boxes except 8, 10, 14, 18
28, 32, 36, 38

Still sub-critical.
U mass = 11.37 kg \text{U}^{235}\n
Boron mass = 4.26 \text{gB}^{10}\n
Critical conditions:

<table>
<thead>
<tr>
<th>Temp</th>
<th>715°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log N</td>
<td>0.15</td>
</tr>
<tr>
<td>DC-5</td>
<td>57 (10x20)</td>
</tr>
</tbody>
</table>

Height 109.2 cm  
Bale 3.015 in  
Rod 29.01 in

Rod pulled to 9.06 m; positive period measured.

\[
6.3 \times 21.74 = 136.5 \approx 10
\]

\[
7.64
\]
Loading - same as 14-5 except slot 16
Slot 16 contains 22 in all boxes except 8, 9, 10, 14, 18
21, 25, 28, 32, 36, 37, 38.

\[ \text{U mass} = 11.37 \text{ kg U}^{235} \]
\[ \text{Boon mass} = 4.26 \text{ g B}^{10} \]

Critical conditions:
- Temp. 71.5°F
- Log N = 0.15
- Blaze = 3.05 cm
- De. S = 57 (10 x 80)
- Rod = 29.01 cm

Rod pulled to 9.00 cm; positive period measured.
Preliminary solution analyses (uncorrected for ion)

12-8-55

1.1339 Spec. Grav.
0.09698 gm U/gm solution
0.1099 gm U/cc
0.102 gm U-235/cc

9213 Spec. Grav. Thrac. 1.1197
0.1086 gm U/cc
0.1012 gm U-235/cc

Design Element
2240±10 cc
0.104 gm U-235/cc

12-12-55

Y-12 analytic lab requisition # 350786 gram for solution analysis.

0.0966550 gm U/gm solution
0.08998 gm U-235/gm solution.
Loading: "Cold Clean Critical", 7 ½+ plates/Box
Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Type F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5 F 5

Slot 8: Boxes 7, 11, 35, 39
Box 7 Slot 8 Fast Plate # 3-41
  " 11 "  Mnc 378
  " 35 "  4-20
  " 39 "  6-40

Loading/Box w/½ plates = 233 gms U 235
Mass: 10,562
<table>
<thead>
<tr>
<th>Critical</th>
<th>Control Blade 7.39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log N</td>
<td>0.105</td>
</tr>
<tr>
<td>DC-3</td>
<td>76.1</td>
</tr>
<tr>
<td>Control Rod</td>
<td>2901</td>
</tr>
<tr>
<td>Water Nt</td>
<td>109.5</td>
</tr>
<tr>
<td>Temp</td>
<td>72°F</td>
</tr>
</tbody>
</table>

It was decided to pull the equivalent of 2-\(\frac{1}{4}\) plates in order to put the critical position of the blade farther out. This is in anticipation of an increase in reactivity of ~15%, when the Homogeneous element is substituted for a Normal Fuel Box.

Note: Boxes are in the same location as listed on page 51.
Loading: Same as 15-7, except the following 3 plates were substituted for full plates in Boxes 2 & 3.

<table>
<thead>
<tr>
<th>Slot</th>
<th>Box</th>
<th>Plate</th>
<th>Substituted For Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>7</td>
<td>5-7(hal)</td>
<td>3-41(hal)</td>
</tr>
<tr>
<td>8</td>
<td>39</td>
<td>6-39</td>
<td>6-40</td>
</tr>
</tbody>
</table>

Mass: 10-531

Critical:

log N: 1.03

DC: 3 74, 10,10

Water Ht: 109.7

Get Control Blade 12:47

Control Rod 29.01

Temp 72°F

The remaining 2 full plates in Slot 8 will be replaced in order to give more Control Blade area to control the homogeneous Box.

Results:

2-1/2 plates in Box 7+39 are worth \(-12.44 - 3.38\) = 5.07 in.

This is worth 8.3[ from chart or 0.2676] pm US
Expr 15-3 Time 2:40 Date 6066 1955
Purpose Homogeneity Test Core Run

Personnel MB 41-42 06

START-UP CHECK LIST
Equipment Checked by MB Instrument and Safety Equipment MB
"Source In" Checks MB
Emergency Equipment Ready Start-Up
Red Light On by RA Start-Up OK'd by MB Time 2:40 PM Date 8 Dec 1955

Loading: Same as 15-1, with no extra full plates, uniform
7.5 Plates / Box
Mass: 10.5 kg A215

Critical:
Log N 0.11 X Control Blade 2.91
DC-3 76110110 Control Rod 2.01
Water Ht 109.5 Temp: 72°F

From the control blade evaluation curve, the change in position (between 15-3 and 15-2) is worth 8.36 joules.
The fuel in this position is worth 12500 Btu/gal when averaged with 15-2. The fuel worth comes out to be 479 Btu/gal for this position.
Loading - pure 7½ loading - same as 15-1 without extra full plates.

In position 37, the special fuel box has been inserted. This box is a water-tight container the same size as the fuel box, eight cm x 3.5 plates in normal position, and inside the box.

See fuel box contains 2,520.5 kgm. of solution of 23.2 kgm. of U235. The rest of the boxes contain 7½ plates of fuel or 230 kgm. U235.

Critical Conditions:
1 Water Height 99.2 cm. Rod 29.01
   Log N 0.062 Bleb 0.01

2 Rod inserted: Water taken up.
   Water Height 109.1 cm. Rod 15.25
   Log N 0.205 Bleb 0.015
   DC 3 82.5 (10 x 20)
   1 imp. 7.25°F
Rod withdrawn to 29.02. Positive period measured

For a factor of 10, the period to 40 divisions.

\[
\frac{40 \times 21.72}{29.02} = \frac{869.52}{29.02} = 1.447
\]

The blade from 20.91 to 0 was worth 22.8 ft.
(fromrod calibration curve)

\[ \text{The total change in reactivity between runs 15-3} \]
\[ \text{15.4 ft. was 25.3 ft.} \]

Note: Volume of solution in container was determined by three methods: weight loss of container: 2.539.5 ± 1 gm.
weight of element: 2.525. ± 1 gm.
volume of material put in element: 2.250 cc.

Using the average of the density measurements
( pg 58) together with the volume measurement,
the mass injected was 227.5 gm.
Critical Conditions

<table>
<thead>
<tr>
<th>Height</th>
<th>109.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log N</td>
<td>0.195</td>
</tr>
<tr>
<td>Rod</td>
<td>29.02</td>
</tr>
<tr>
<td>Blade</td>
<td>14.26</td>
</tr>
<tr>
<td>DC-3</td>
<td>75.5 (10x20)</td>
</tr>
<tr>
<td>Temp</td>
<td>71.5°F</td>
</tr>
</tbody>
</table>

Blade pulled to 17.25°; positive period measured.
Blade pulled to 20.88°; positive period again measured.
START-UP CHECK LIST

Equipment Checked by DW
Personnel Check by DW
Instrument and Safeties Checked and Reset by DW
Sources In' Checked by MB Source No.
Emergency Equipment in Control Room Checked by MB
Red Light On by MB
Start-Up OK'd by DW

Time: 9:50 AM
Date: 12-6 1965

Loading exactly the same as 15-4 except the Homogenizer box is now in position #4/3.

Critical Conditions:

Height 109.8

Rod 29.02 DC-3 25.5 (10x20)

Blade 14.26 Temp 71.5°F

Blade pulled to 17.25 - positive period measured.
Blade pulled to 20.88 - positive period again measured.
Loading same as 15-4 (including homogeneous box in position 27) except half plates pulled from boxes 21-25.

Critical conditions:

- Height: 109.4
- Rod: 29.02
- Blade: 16.25

This has excluded the fuel in boxes 21-25.

Value of blade at 16.25 is 20.2 ft. (From calibration curve)

The value of the fuel is therefore 20.2 + 1.4 = 21.6 ft.

(0.695 ft/gm ft)

MB
Loading - complete loading of 7/4 with half plates removed from 7, 11, 35, 39. Homogeneous element in #37. (For units numbers, see page 59)

\[
\begin{align*}
\text{LogN} & = 0.14 \\
\text{DC-3} & = 51 (10/20) \\
\text{Temp} & = 71.5°F \\
\text{Wtr} & = 109.1 \\
\text{Red} & = 29.01 \\
\text{Blade} & = 15.995
\end{align*}
\]

The value of the half plates in 7, 11, 35, 39 is

\[
\text{The value of the plate from 16 to 0 } = 1,441
\]

\[
\text{This is from the blade calibration curve}
\]

\[
14.99 + 1.441 = 16.431
\]

Loading - complete loading of 7/4 with half plates removed from 7, 11, 21, 25, 35, 39. Homogeneous element in #23. (For units numbers, see page 59)

The total value had removed from the reactor from the original zero point (15-3) to this loading is 21.431 (exp 15-7) plus 21.64 (exp 15-6) or a total of 43.07.

\[
\begin{align*}
\text{LogN} & = 0.11 \\
\text{DC-3} & = 79.10 (10/10) \\
\text{Temp} & = 72°F \\
\text{Height} & = 109.4 \\
\text{Red} & = 29.01 \\
\text{Blade} & = 13.06
\end{align*}
\]

The blade value between 20.9 (exp 15-3) + 13.06 (this exp) is 33.96. / 12.3

\*: The total reactivity change between the "zero" run (exp 15-3) + having the homogeneous box in position 23 is 9.04 + 42.04 or 51.08.

\[
\frac{33.96}{12.3} \approx 2.753
\]
Loading - a straight 3/8 with three additional plates:

<table>
<thead>
<tr>
<th>Plate</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

Box 7 contains 6.76 in slot 8 instead of slot 9.

3.4-11
35  5-378
33  4-20
43  1-17

Note: Yesterday evening when we went to take the demagnetizer box out of the core it found that it has been leaking solution. The contamination in the tank was very well localized to slot 8 of the outer ring. The rubber cover over the dyneide valve. (See page 70)

Conditions: super critical blade in; red in; water up

It is desirable to get the zero rain condition with the blade near zero.

We are pulling, therefore, full plate 8 to out slot 8 of box 89 and re-inserting plates 99.

To determine the amount of the solution lost from the liquid feed element, the concentrate was removed and weighed:

- 3.71 g. = out of the solution bottle (feed)
- 1.59 g. = in tare of bottle (some solution added)
- 2.12 g. = weight removed from liquid element
- 13 g. = weight of residual liquid (P. 67)

Used of solution analysis (in mg/l):

- 475 / 452 / 461
- 470 and 397 = total g. 22.72 cc
- 8 cc lost from meter g. 2.5 cc (P. 67)

(Last page from P. 72)
START-UP CHECK LIST

<table>
<thead>
<tr>
<th>Equipment Checked by</th>
<th>Personnel Check by</th>
<th>Instrument and Safety Checked Reset by</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS</td>
<td>RJ</td>
<td>JL</td>
</tr>
</tbody>
</table>

"Source In" Checked by: JL  Source No.
Emergency Equipment in Control Room Checked by: MB
Red Light On by: JL  Time: 6:45 AM  Date: 12-14-1963
Start-Up OK by: JL  Time: 6:45 AM  Date: 12-14-1963

Loading - Same as 16-1 except 4220 removed and replaced by 5-39.

Critical Correlation:

<table>
<thead>
<tr>
<th>Height 109.6 cm</th>
<th>DE=3 89.5 (10x10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rod 13.13</td>
<td>log N 0.11</td>
</tr>
<tr>
<td>Bld 0.03</td>
<td>R1 4.75 (50x1000)</td>
</tr>
</tbody>
</table>

\[
\text{Man} = 10.562 \text{ kJ}
\]

- 10.50 for Reac
- 10.562 kJ  Crit Man

10/14/63  Water sampled following mixing in runs 16-2, 3, 4-8-10p

<table>
<thead>
<tr>
<th>Sample Reg</th>
<th>3547+1</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Gross m+4</th>
<th>76.754 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tan</td>
<td>45.373</td>
</tr>
<tr>
<td>N/f</td>
<td>31.386</td>
</tr>
</tbody>
</table>

12/15 Result (by inf): 0.03 ppm vs (0.2 gm/l in 1500 g/l).
START-UP CHECK LIST

- Equipment Checked by: 
- Personnel Check by: 
- Instrument and Safety Checked and Reset by: 
- Source In" Checked by: 
- Source No:
- Emergency Equipment in Control Room Checked by: 
- Red Light On by: 
- Start-Up OK'd by: 
- Time: 
- Date: 12-14-1965

Loading same as 16-2 except fill in slot 10, box 25 removed & replaced by 55. Fill 7-25 replaced by 55 10-25

Log N: 0.09

Temp: 73°F

Bandy subcritical with source out
Loading came as 16-2 except SS in slot 8 of 5-25 removal from slot 8 box 8.

Critical conditions:

- height: 109.4
- rod: 13.13
- blade: 12.09
- Temp: 72.5°F

12.09" = 13.34 with 0.25" border 7.5 and plate in slot 10
Loading—complete loading of 64 x 31/2 in. full balls.
plate per box.

Slot: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11 12 13 14 15 16 17 18
Series: 1 2 3 4 5 6 7 8 9 10 11 "B" 15 8 1 10
Material: M 3 M 3 M 3 M 3 M 3 M 3 M 3 M 3 B 3 B 3 B 3 B 3 B 3 B 3

Mass A = 13.3 kg 1.25
Mass B = 85.0 g

Sub-critical
LogN 0.15
Source out; bleed rod out; wake up.

Considered to be within 15% criticality.
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-14-1985</td>
<td>1:17p</td>
</tr>
</tbody>
</table>

**Equipment Check List**
- DC
- Instrument and Gauge Listed
- Emergency Equipment Listed
- Critical Items Listed

**Purpose**
- Start-Up
- Check
- Date

**MB**

**Critical Tasks**
- Load valve 1.5" except full gate
- Run valve 6-8"
- Open 1.5" gate
- Close 2." gate
- Stop 1.5" gate

**Blind Filled to 28.20 psi, positive pressure maintained.**

**Blanket Temperature**
- 13.3°C
- 60% (100 x 0.6)
- R-1

**Critical Condition**
- 105.6°C
- 29.01 in.
- 5.35"
- 13.34 ksi
- 8.0% BWR
- 13.31 MPa
- 15,000 psi
- 10.0% BWR
- 13.3 MPa
- 15,000 psi
- 10.0% BWR

**Notes**
- [Handwritten notes not clearly legible]
9.5 x 45 = 427.5

.5 x 2 = 1

427.5 x 33.4 = 14,299 kg

x 31.1 = 13,285 kg 0.235
Loading: same as 16-5 except half plates in boxes 7, 21, 22, replaced by full plates.

5-7 replaced by 6-40
5-21
5-35

Critical Heater Conditions
Blade 11.635
Rod 29.01
Water 109.2

Log N 0.14
DC-3 55 (10 x 5.5)
R-1 8.1 (100 x 100)

Temp. 75°F
Loading - same as 16-7 except half plate in box 25 replaced by 5-25 replaced by 8.5 8.25

Critical Conditions:

- Water: 109.2
- Log N: .15
- Red Blush: 15.32
- DC-3: 56 (10x20)
- R-1: 3.2 (100x1000)
- Temp: 73 °F

Using the C.C.C. blade calibration curve (which from exp. 16-5 looks to be valid), the value of the field in slot 3 turns out to be 6.4 units.
EXPR: 17-1  Time: 6:20 AM  Date: 12-15-1965
Purpose: Effected dumping ofokers.

Personnel:

Zero Run

START-UP CHECK LIST

Equipment Checked by: MB  Personnel Check by: MB
Instrument and Setting Checked and Reset by: MB
"Source In" Checked by: MB  Source No.: MB
Red Light On by: MB  AM

Loading: Complete loading of 3 1/2 plus exchange

slot

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Swim

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Material

3 6 3 6 3 6 3 6 3 6 3 6 3 6 3 6 3 6

except: slot B box contains 6-464 instead of 5-7

21 = 378  = 5-21
25 = 1-17x  = 5-35

INSTRUMENT CHECK


<table>
<thead>
<tr>
<th>Instrument</th>
<th>Value</th>
<th>Scale</th>
<th>Source Distance</th>
<th>Eccentric Scale</th>
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<tr>
<td>DC-1</td>
<td></td>
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<td>HT-1</td>
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<td>HT-2</td>
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<tr>
<td>Log R</td>
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<td>R-1</td>
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<tr>
<td>R-2</td>
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<tr>
<td>P. M.</td>
<td></td>
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</tbody>
</table>

Water up, back out, rod out, source out.

Log N 0.8

Reactor sub-standard.
Expt. 17-2  Time: 7:00 AM  Date: 12-15-1965
Purpose: Effect of Lumping 100 cc

Personnel:

START-UP CHECK LIST
Equipment Checked by MB  Personnel Check by MB
Instrument and Safeties Checked and Reset by MB
"Source In" Checked by JD  Source No.
Emergency Equipment in Control Room Checked by MB
Red Light On by MB  AM
Start-Up OK'd by JD  Time: 7:00 AM  Date: 12-15-1965

Loading: Same as 17-1 plus:

- Full plate in slot 2 box #11 (1-1/4" in - 5-11 out)
- 25 (1-1/2" in - 5-25 out)
- 39 (5-4" in - 5-59 out)

We then now have a complete loading of 9½ plates of 6 bulk plates.

Notes: Run 17-1 should have agreed with run 16-7. The "zero" seems to have taken a drastic shift.

Critical Conditions:
Blade 13.37  Log N  0.91
Rod 29.01  Dc 2  67 (10 x 10)
Water 109.2  R 1  4.1 (50 x 1000)

Temp. 73°F
Loading: Same as 17-2: Except the Boron fall plate in slot 14. Box 23 was replaced by Boron plates in slots 14+2, and steel removed from slot.

Subcritical: Source out; Rod Blank out.

\[ \log N = 1 \]

By changing the Boron from a single fall plate to two \( \frac{1}{2} \) plates, the effect of Boron Poisoning is increased.

The magnitude of this effect is \( > 29\% - 13.3\% \) on the Control Blank.

\[ \sum 22 - 16 \approx 11\% \]
Expo: 17-4 Time: 9:00 AM Date: 14 Dec 1965

Purpose: The effect of damping boron
(Evaluation of fuel)

Personnel: MB, JE, RJ

START-UP CHECK LIST
Equipment Checked by: MB Personnel Check by: AS
Instrument and Safeties Checked and Readied: JE
Source in Checked by: MB
Emergency Equipment in Control Room Checked by: AS
Red Light>On by: AS
Start-Up OK'd by: CM Time: 9:00 Date: 14 Dec 1965

Loading: Same as 17-2, except that a full fuel plate was put in place of 1/4 plate 5-37, in slot B of Box 37.

Critical:
Water: 109.5
Log N: 1
OC-3: 72 x 10^11

Control Blade: 17.46
Control Rod: 29.01
Temp: 92.5°F

The apparent effect of loading the extra 1/4 fuel plate was only of the order of 1%. At this point it was decided to recheck the zero loading of 17.2.
Expt. 17-65  9.30  0  18 Dec 1965
Purpose: The effect of Lamping of Boron
[Reach Zero burn (17-D)]
Personnel: MB JI GL KS

Equipment-Checked by  MB  JI GS
Instrument  MB
Source BS
Emergency Lights  M  BS
Red Light ON by  JI
Start-Up OK'd by  MB  9.30  0  Date 18 Dec 1965

Loading: Same as 17-2

Critical:
Water 109.5  Control BL 16.49
Log N. 11  Control Rod 29.01
DC-3 79.5  X10X20  Temp 72.5

The "Zero" position found for this loading in run 17-3 was at 13.33" on the Control Blade.

Higher power level position mean:

Critical:
Water 109.5  Control BL 15.01
Log N. 19  Control Rod 29.01
DC-3 79.5 X10X20  Temp 72.5
START-UP CHECK LIST

Equipment Checked by: HJ Personnel Check by: MB
Instrument and Fittings Checked and Report by: AJ
Source In" Checked by: RS
Emergency Equipment in Control Room: Heartily
Red Light Lim: RL
Start-Up OK'd by: RJ Time 10:50 AM Date: 12-15 1965

Loading:

dot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

materid: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Reactor very sub-critical, blank out, rod out, water set up

Log N 0.01
START-UP CHECK LIST:

Equipment Checked by DL
Personnel Check by DL
Instrument and Safeties Checked and Reset by RS
"Source In" Checked by SB
Emergency Equipment in Control Room Checked by YMB
Red Light On by YMB
Start Up OK'd by RS

Loading - complete loading 8-11

Slot: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series: 1 2 3 4 5 6 7 12 9 7 8 12 11 10 9 2 10

Critical with Height of 90.5 cm

Log N = 0.12

DC-3 84 (5 x 10)

Red out: blank in; source out.

Too realistic; going to pull 12 half plates.
Critical Conditions:

log N 0.16  Height 109.2
DC-3 58.5 (20x10)  Blade 13.40
R-1 3.6 (100x100)  Rod 29.01

Temp. 73°F

Critical mas with blade = 15.18

u max = 15.21 (g U^2/5) / 15.20^5  kg/ft
b max = 127.5/8m Nut B

Blade pulled to 16.65, positive period measured.
Loading - same as 16-10 except slot E contains half plates in the following boxes: 1, 3, 5, 14, 16, 18, 28, 30, 32, 41, 43, 45

Critical conditions:

- \( L = 0.16 \)
- \( D = 58.5 \) (20x10)  
- \( R = 5.6 \) (100x100)  
- \( \text{Temp.} = 73^\circ \)

- \( \mu_{\text{mass}} = 15.21 \) kg/m/s
- \( B_{\text{mass}} = 187.5 \) kg

Blade pulled to 14.45 + positive period measured.
INSTRUMENT CHECK

Date: 16 Dec 1965  Time: 4:42 AM

DC-1
DC-2
DC-3
Log No
R-1
R-2
P. M.

Source No.

Distance
Start-Up Scale

INSTRUMENT CHECK

Date: 16 Dec 1965  Time: 4:42 AM

DC-1
DC-2
DC-3
Log No
R-1
R-2
P. M.

Source No.

Distance
Start-Up Scale

Exp. 16-12  Time: 12:00 PM  Date: 16 Dec 1965

Purpose: Critical Mass - Bom

Zero Run

Start-Up Check List

Equipment Checked by DH
Instrument and Source

Emergency Core

Red Light OK by RJ
Start-Up OK'd by DH

Loading Same as 16-11 Zero Check

Critical Conditions

Water: Height 109.1 Temp 78°

Log N .155
DC-5 5.4 (10x20)
R-1 3.4 (100 x 1000)

Blade: 17.5 16.5 0.5

Rod: 19.01
START-UP CHECK LIST

Equipment Checked by: RJ Personnel Checked by: RS
Instrument and Safeties Checked and Reset by: RJ
"Source In" Checked by: RJ Source No: 95
Emergency Equipment in Control Room Checked by: RJ
Red Light On by: 16 AM
Start-Up OK'd by: 16 Time 1807 PM Date: 16 Dec. 1955

Loading: Same as 16-12. Except SS plate 8-25 in Slot B Box 25
in place of fuel 12-25

The following fuel plates were placed in place of 4 plates,
in Slot B,

Full Plate 5-13 BOX 1 in place of 4 plate, 5-1
  " 1-17 3 3 3 3 3 3 3 3 5-3
  " 4-20 5 5 5 5 5 5 5-5
  " 6-40 41 41 41 41 5-41
  " 1-16 43 43 43 43 5-43
  " 1-19 45 45 45 45 5-45

This extra fuel was added to balance the removal of
the fuel plate (12-25) and also to bring the critical blade
up high enough so that the excess reactivity
addition when a ½ plate is put in slot B Box 25 can be measured
on the control blade.

The Arrangement was Subcritical.
Expr. 16-14  Time 10:59 AM  Date 16 Dec 1965
Purpose  Critical Mass with Boron
         Fuel calibration for A/K/A measurement
Personnel: RJ, JL

START-UP CHECK LIST
Equipment Checked by RJ  Instrument and Safety check by RJ
"Source In" Checked by RJ  Emergency equipment in place and correct
Red Light On by RJ  Start-Up OK'd by RJ  Time 1000 AM  Site Late 16 Dec 1965

Loading: Same as 16-13 except # plate 5-13 is inserted
in Box 13 Slot 9 in place of SS 9-13

This arrangement was satisfactory.
START-UP CHECK LIST

Equipment-Checked by: ______ Personel-Check by: RJ
Instrument and Safeties Checked and Reset by: ______
Source in- Checked by: ______ Source No.: ______
Emergency Equipment in Control Room Checked by: ______
Red Light On by: ______ AM
Start-Up OK'd by: ______ Time 1926 PM Date: 16 Dec 1955

Loading: Same as 16-14 except 1/2 plate 5-29 is inserted in Box 28 Slot 9 in place of SS 9-28.

Critical:

\[
\begin{align*}
\log N & = 16 \\
OC & = 3 \, 56 \times 1000 \\
Water Ht & = 109.8 \\
Water Temp & = 73.5 \degree F
\end{align*}
\]

This critical position will be used to find the value of a 1/2 fuel plate added to Slot 8, Box 25, in place of a stainless steel plate.

\[
\begin{align*}
25 & \times 0.06 \\
\div 15 & = 0.06 \\
15 & = 2.95
\end{align*}
\]
Loading: Same as 16-15 except that 55 in Slot 8 of Box 25 was replaced by 4 Plate 5-25.

This experiment compared with 16-15 will give the value of a 4 plate in slot 8 Box 25.

Critical:

\[
\begin{align*}
\log N & = 16.16 \\
Dc3 & = 64.110.20 \\
Water Ht & = 109.6 \\
Water Temp & = 73.5^\circ F
\end{align*}
\]

Control Blade pulled to 18.03 from 14.14 giving a
The blade completed to positive period of 208 sec.
This period calculates to be 5.4 sec.
START-UP CHECK LIST
Equipment Checked by DM, Second Check by RJ
Instrument and Safety Train insurance AL
"Source In" Checked by DM
Emergency Equipment in good condition Checked by RJ
Red Light-On by RJ
Start-Up OK'd by DM Time 2:12 PM Date 16 Dec 1965

Loading
Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series 1 13 3 "B" 4 5 6 7 8 9 10 11 12 13 14 15 8 2 10
Type f f B f f f f f f f f f f f f

Equivalent to a full 13 plate 1/怎能 loading.

* Slot 7
Contains SS in Boxes 1-3-5-6-8-10-12-14-16-18
Contains f fuel (5) in Boxes 2-4-7-9-11-13-15-17-19.
(Note: Box 25 has fuel (5) in Slot 8, Fuel 12-25 in Slot 7)

Slot 12
Contains fuel Series 14 in Boxes 1-3-5-6-8-10-12-14-16-18
Contains fuel Series 5 in Boxes 2-4-7-9-11-13-15-17-19.

Borom Mass = 2 x 45 x 182 gms = 169 gms
U35 Mass = 13 x 14.97 = 181.2 Kgs

Super Critical at 781 "of Water
START-UP CHECK LIST

- Equipment Checked by DM  Personnel Check by RF
- Instrument and Safeties Checked and Reset by RF
- Source In' Checked by DM  Source #____
- Emergency Equipment in Control Room Checked by RF
- Red Light On by RF  AM
- Start-Up OK'd by DM  Time 2215 PM Date 16 Dec 1955

Loading: Same as 16-17 except all Series "5" + plates were removed from slots 24.12 of bars 1,4,2,9,11,37,39,41,49, and replaced with 55 of the proper Series (2412)

Slot 8, Box 25 still contains a + plate (series 5) and a full fuel plate in slot 7.

Supercritical: with water at 829.
Equipment Checked by OM Instrument and Safety No. OM
"Source In" Checked by OM Emergency Equipment in Control Room Located by JS
Red Light On by RS Start-Up OK'd by OM Time 22:40 PM Date 16 Dec 1965

Loading

Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Series 1 13 3 "A" 4 1 7 11 9 7 9 12 11 "B" 15 8 2 16
Type f f f F F F F F F F F F F F F F F

Slot 8 Box 25 contains Series 5 plate, Slot 7 Box 25 contains Full 12

Supercritical 97.3
START-UP CHECK LIST

Equipment Checked by DM Personnel Check by PT
Instrument and Safeties Checked and Reset by DM
Source in" checked by DM Source No.
Emergency Equipment in Control Room Checked by RS
Red Light On by RS AM
Start-Up OK'd by DM Time 23,05 PM Date 16 Dec 1965

Loading:
Same as 16-19 except the following 4 plates were put in the place of fuel plates -
Box 7, 4 plate 5-7 put in place of plate 13-7 in slot 2
Box 11, " 5-11 " " " " 15-11 " 2
Box 13, " 5-35 " " " " 13-35 " 2
Box 39, " 5-39 " " " " " " " "
also Box 25 55 plate 7-25 was put in in place of 4 plate 5-25. (Slot 7)

Kg 25 = (12 x 1.4) - (4 x 0.42) = 16.73 Kg 16.73

Critical 16.65

Log N .17   Control Blade 4.99
OC-3 69 x 10 x 20  Control Rod 2.90
Water ht. 109.7  Water Temp 72.5
Loading:

slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
series 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
material f f f f f f f f f f f f f f f f f f f f
except for the following exchange in slots:

Box 7 contains 5-7 instead of 13-7
11 5-11 13-11
35 5-35 13-35
39 5-39 13-39

and fuel 12-25 and 55 7-25 have been interchanged.

Reactor subcritical - rod in, blade in, water up, source out.
Loading = same as 16:21 except 13-9 pull has been replaced by 2-8.35.

Still too reactive - source out, rod out, blank in.
START-UP CHECK LIST

Equipment Checked by: [Signature]
Personnel Check by: [Signature]
Instrument and Safeties Checked and Revealed by: [Signature]
"Source In" Checked by: [Signature] Source No.
Emergency Equipment in Control Room Checked by: [Signature]
Red Light On by: [Signature] Time: [Time]
Start-Up OK'd by: [Signature] Time: [Time] Date: 12-19-1965

Loading—Same as 16-21 except US-16 in slot 2, box 16 has been replaced by S.S. 2-16.

Critical Conditions:

DC-3 56 (10 X 20) Height 20
Log N 0,14 Blade 6.30
R-1 3.7 (100 X 100) Rod 29.01
Temp. 78.6°F.

Man 16.128

Computed Man 0.152 Kg/sec

16.63
Exp.: 16-24
Time: 1:40 AM
Date: 12-17 1965

Purpose: Att/Out with Boron
Adding 1 (1) plates to Box 25

Personnel: MB JJ RS

START-UP CHECK LIST
Equipment Checked by RS Personnel Check by JL
Instrument and Safeties Checked and Reset by RS
Source Inn Checked by 11-0 Source No.
Emergency Equipment in Control Room Checked by RS
Red Light On By RS Time 10:00 AM
Start Up OK'd by RS Time 10:00 AM Date 12-19 1965

Loading: Same as 16-23 except 4 fuel plates 5-15 were
put into 5/10, 6/10, 26, in place of 55 7-25

Critical Conditions:
OC-3 7.4 x 10^20

Wt. ht. 109.7

Log 18 0.18 Control Blade 0.00

F-1 4.15 x 10^20 Control Rod -29.01

Temp

Control Blade pulled out to 6.30", He p critical
blade position of the 16-23 Zero Run.

16.716

He/I = 0.09

116.13
loading same as 1b-24, except that Boron 7 plates were inserted in slots 4, 7, 12, 14 of Box 27, and Boron fuel plates removed from slots 9, 14, 85 plates 7-23, and 12-25 were removed from slots 7-23, respectively.

Critical Condition:

DC-2 82 10 X 20
Log N- 2
R-1 2.2 200 x 100
Temp. 225

Control Black pulled to 15.70 for a point on new Black Calibration Curve

Worth 12 4
START-UP CHECK LIST

Equipment Checked by MB Personnel Check by RJ
Instrument and Safeties Checked and Reset by JL
"Source In" Checked by RJ Source No.
Emergency Equipment in Control Room Checked by MB
Red Light On by JL Time 8:50 AM
Start-Up OK'd by RJ Time 8:55 AM Date 12-19-1965

Loading

Slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Complete loading at 13½ ft and 4 2½ Bore.

Plates which are not in proper source position:

Box Slot 15 Slot 12
36 A-264
67 3-41k
38 1-15k
40 1-17k
41 4-20k
42 6-40k
43 7-16k
44 1-19k
45 941.4 952H.

Supercilial at water height ~ 89.6 cm.
Blanking rod out, source out.
**START-UP CHECKLIST**

<table>
<thead>
<tr>
<th>Equipment Checked by</th>
<th>MB</th>
<th>RS</th>
<th>LA</th>
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</thead>
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<tr>
<td>Instrument and Safety</td>
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<tr>
<td>Source In</td>
<td>MB</td>
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<td>Emergency Light</td>
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<td>Red Light On</td>
<td>RS</td>
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</tr>
<tr>
<td>Start-Up OK'd by</td>
<td>MB</td>
<td>LA</td>
<td></td>
</tr>
</tbody>
</table>

**Loading:** Same as 11-26 except that 6 1/2 plates were removed and replaced by steel in the following boxes:

- In Box 8 fuel(3) 5-8 in slot 7 was replaced by 55, 7-10
- " 10 " 5-10 " 7 " 55 7-10
- " 21 " 5-10 " 7 " 55 7-21
- " 25 " 5-25 " 7 " 55 7-25
- " 36 " 5-36 " 7 " 55 7-36
- " 38 " 5-38 " 7 " 55 7-38

**Critical at Water height 91.3**
loading: Same as 16-26 with the following changes.

In Box 7: 1 fuel plate 5-7, in Slot 7 was replaced by 55 2-9.

<table>
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<th>5-9</th>
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<tbody>
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<td>11</td>
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<td>37</td>
<td>5-37</td>
</tr>
<tr>
<td>39</td>
<td>5-39</td>
</tr>
</tbody>
</table>
Loading—same as 16.26—except for slot 7:
slot 7 contains twice the fuel in boxes 1, 3, 5, 8,
10, 12,..., 38, 40, 41, 43, 45; s.s.rium 7 stub
in rest of boxes.

Critical Conditions

\[
\begin{align*}
\log N &= 0.13 \\
\Delta x &= 3 \times 10^{-10} \\
R &= 3 \times 10^{10} \\
T &= 78^\circ C
\end{align*}
\]

\[
\text{Mass: } 13 \times \left(\frac{14}{16}\right)^{\frac{1}{2}} \times 0.4 = 13.267 (1.399) = 18.596
\]

\[
\text{Irb} = 18.56 \times (1 - 0.23) = 14.540 \text{ } \text{kg} = 14.540 \text{ } \text{kg}
\]

\[\text{Hd correction} = -0.05\]

\[\text{boron} = 47.2\]
START-UP CHECK LIST

Equipment Checked by DL Personel Check by JL
Instrument and Safeties Checked and Restored by JL
"Source 16" Checked by RJ Source No.
Emergency Equipment in Control Room Checked by MB
Red Light On Pumps Checked by MB
Start Up OK'd by RS Time 9:50 AM Date Dec 19 1955

Loading - Same as 16-27 except 36% removed
from slot 74 replaced by 36 in box 25 only.

Critical conditions

Log. N 0.11 Height 109.4
DC-5 4410210 Red 29.02
R-1 2610011800 Blade 8.14 9.60

Temp. 73°F

Date pulled to 11.26, the zero point of Jan 16-27
inducing a period of 314.6 sec. or 3.8 hr.

Mass: 18.5 lb 1 man

.024 #4 blade unit

18.5 H 7
5 \times 34 = 170' = 51.76 \text{ sec}

5.84

11.36 + 13 = 24.36'

9.5 \text{ in Clark}
Expr. 16-29  Time 2230 AM  Date 19 Dec 1965
Purpose: 0.5/1  With Beson, 24 plate

Personnel: MB JL RJ DW

---

**START-UP CHECK LIST**

- Equipment Checked by JL
- Personnel Check by JL
- Instrument and Isolation Checked and Read by MB
- "Source In" Checked by MB  Source No.
- Emergency Equipment in Control Room Checked by RS
- Red Light On by RJ AM
- Start-Up OK'd by MB  Time 3221 PM Date 19 Dec 1965

---

**Loading:** Same as 16-28 except that in Box 25

- 5-25 in Slot 7 and 12-25 in Slot 8 were interchanged.

  So that 1/4 plate 5-25 is in Slot 8, and Full Plate 12-25 is in Slot 7.

---

**Critical Conditions**

- log N 1.19  Control Blade 10.87
- DC-3 83.14X20  Controlled 27.02
- A-1 2.27X100X100 Water At 109.6
- Water Temp 73°F

- Mass 18.595 Kg 19.25
START-UP CHECK LIST.

Equipment Checked by: JH
Instrument and Safety Systems by: MB
Source Is: 

Emergency Equipment and Reactor Systems: RS

Red Light On by: RS

Start-Up OK'd by: MB

Loading: Same as 16-19, except SS 2-25 in put in place of 5-25 in box 25 slot 8.

Mass: 18.59 kg. \( \text{U}^{235} \)

Critical:

\( \log N = 1.9 \)

Control Blade: 18.445

DC-2 80 10X10

Control Rod: 29.02

R-1 Jammed

Water Ht.: 109.5

Water Temp.: 73°F

Control Blade moved into 10.37, the critical position of 16-29, to find the worth of the \( \text{U}^{235} \) plate in slot 8.
<table>
<thead>
<tr>
<th>Box #</th>
<th>Fuel</th>
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<th>Fuel</th>
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<tr>
<td></td>
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</table>
START-UP CHECK LIST

Equipment Checked by RS, Personnel Check by JL
Instrument and Safety Checked and Signed by MB
"Source In" Checked by MB, Source No.
Emergency Equipment In Control Room Checked by RS
Red Light On by JL, AM
Start-Up OK'd by MB, Time 18:53 PM Date 20 Dec 1965

Mass: $14 \frac{1}{2} \times 1.397 = 20.33$ kg

Critical Conditions: (Slightly Super)

Log N. = 7
DC-3
R-1
Water temp. 73°F

Water Ht. 93
Blade 0.00
Rod 19.02
START-UP CHECK LIST

- Equipment Checked by: RS
- Personnel Check by: MB
- Instrument and Safety Checked and OK: JL
- Source In is: Checked by: RS
- Emergency Set-up in Control Room checked by: MB
- Red Light Up by: RS
- Start-up OK'd by: RS
- Time: 8:30
- Date: 12-20-1965

Loading: 31

Same as 16:56 except:

- box 8, slot 12 now contains 3.5:
  - 10
  - 21
  - 26
  - 36
  - 38
  - 3
  - 6.40
  - 42
  - 1-15
  - 44
  - 15-10

Total U mass = 201 kg U²³⁵ 20.105 kY
Total B mass = 355 gm Net B 66.4 Hal and others 20.101 units

Critical Conditions:

- log N: 0.14
- Had: 19.03
- DC-3: 47.3 (10x20)
- Rod: 29.02
- R-1: 3.0 (100x100)
- Water: 109.2

Temp: 72.5°F
START-UP CHECK LIST

Equipment Checked by ______ Personnel Check by ______
Instrument and Safety Checked and Inspector by ______
"Source In" Checked by ______ Start-up ______
Emergency Equipment in Control Room Checked by ______
Red Light On by ______ Start-Up OK'd by ______ Times ______
Date ______

Loading-
Same as 16-32 except:

- in box 25, slot 7 now contain 5.5 (instead of half-plate)
- slot 12 now contains fuel #307 [F-1]

Critical Conditions-

DC-3 45.5 (10120) Plane 15.01
R-1 2.8(100x100) Rod 29.02
LogN 0.125 Water 109.2 cm.
Score 72.5°F
Expr. 16:34  Time 9:26 AM Date 20 Dec 1965
Purpose A/k/A, with Boren -- slot 7

Personnel: MB, KS, JL

START-UP CHECK LIST
Equipment Checked by: KS, JL
Instrument and Safety Checked and Reset: MB
"Source In" Checked: MB
Emergency Equipment in Control Room Checked by: KS
Red Light Off by: KS  AM
Start-Up OK'd by: MB  Time 9:30 AM Date 20 Dec 1965

Loading: Same as 16-33, except that 1 fuel plate S-25 is put into slot 7, Box 25, in place of SS, (12-25)

Critical Conditions
\[
\log N = 16.5 \\
Dc-3 = 57110x20 \\
Water Temp = 72.5 \\
Water Ht. = 109.5
\]

Control Blade pulled out to 15.01" to critical position of 16-33, to measure the reactivity worth of adding a 1/4 plate to slot 7, Box 25.

When \(20.17^2\) 0.00 make note
20.112
Loading - same as 16-33 except slot 7
Box 25 now contains fuel 12-25 and
slot 8, box 25 contains S.S., 12-25.

Critical Conditions

logN 0.12   Blade 17.5 in.
DC-8 4.35 (10x20)  Ref 29.02 in
R-1 2.781  Water 109.2 in
Temp. 12.5°F
Critical Conditions:

Length 0.150 - Water 109.2
DC-3 6.1 (60x20) - Blade 14.23
R-1 3.8 (100x100) - Rod 29.01
Temp 72.5°F

Pulling blade to 17.495 for positive period measurement.
Loading - Same as 16-35 except lot B, which now contains 15-25 instead of 55.5-25.

Critical Conditions:
- LogH 0.153
- Water 109.2
- DC-3 6.1(10x20), Blade 14.23
- R-1 3.8(100x100), Rod 29.01
- Temp 72.5 \degree F

Pulling blade to 17.495 for positive period measurement.
Loading for red position boxes: 9, 11, 21, 31, 32, 37.

Slots 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1 0 5 7 8 9 10 11 12 13 14 15 16 17 18

Very sub-optimal.

Wake up.

Source out.

Log N 0.0007

Blade out.

Red out.
Loading - fuel loading in all boxes is the same as 18-1
- boron loading in box three as 18-1 except:
  in "core" boxes - the series "B" boron in slot 5 has been
  changed to series "C".
  in "al" boxes - 9, 21, 25 x 37 contain boron series "C".
  in slots 9, 14
  - 15, 23, 31 contain 5.3 plates in slot 9.

Critical - water height 78.7
\[ \log N = 0.09 \]

Loading - 54 fuel in all boxes as in 18-1
- boron loading for rod boxes
  same as in 18-2
- core boxes same as 18-2
  except boxes 2, 4, 5, 6, 8, 10
  ..... 41, 43, 45 (large checker board)
  now contain series "B" boron

Critical - water height 84.7
\[ \log N = 0.16 \]
LOADING - SAME AS 18-1 EXCEPT THAT 31,327 NON CONTAIN SERIES 2" (4) BORON PLATES IN SLOT 9

CRITICAL CONDITIONS

WATER LEVEL 109.6 FT WATER TEMP 71°F

LOG - N 22
K-1 5.7 (200,000)
DC - 3 52 (0050)

RED POSITION 29.02
BLADE 11 16.21

WATER

\[(15 \times 30.311 = 17.736)\]
\[\frac{17.736}{2.27} = 7.831\]
\[\frac{7.831}{3.31} = 2.41\]

Back Current
\[-0.2\]
\[20.34\]

[Equations and calculations related to critical conditions, including values and units.]

Not Critical
Water Up
Blade out
Red out
Steam out
Load 0.015
Loading: Same as 18-3 except full boron plate removed from the following boxes and replaced with half-boron plates: 8, 10, 14, 18, 28, 32, 36, 38.

\[ H_2O \text{ Height} = 109.0 \text{ in.} \quad H_2O \text{ Temp} = 72.7 \text{°C} \]

\[ \log N = 0.13 \]

\[ DC = 8 \quad 67 \quad (10 \times 20) \]

\[ RL = 4.3 \quad (100 \times 100) \]

GLAD 19.15 in.

Rod 29.02 in.

Mass = Mass of 18-4 = 20.04 kg

\[ \text{blade correction} = -0.01 \]

\[ 20.04 - 0.01 \]

\[ 19.03 \text{ kg} \]

\[ \text{Boron} = 3.38 \times 1.889 - 4 \times 1.889 = 208 \text{ g} \]

\[ + 2.5 \times 7 \times 1.889 = 33 \]

\[ 241 \]

---

Critical Conditions:

\[ \log N = 0.12 \]

Control Blade 14.99

Control Rod 11.02

Water Temp 72.5

Water Ht. 109.6

The effect of adding and boros to the top of the assembly is that the core is slightly more reactive. Control blade is lowered from 71.15 to 16.99 (18.2) to 16.99 (18.2) or 3.35%. This difference is negligible when considered in terms of Uranium Mass.
loading: Same as 16-37, with some changes in the odd loading of slot 12

<table>
<thead>
<tr>
<th>Shot</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>F</td>
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</table>

(over)
**Slot 12**

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<thead>
<tr>
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<th>8x3</th>
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<td>12-15-12</td>
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<td>2-4</td>
<td>15-15-13</td>
<td>24</td>
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<td>3-6-31</td>
<td>14-15-14</td>
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<td>4-6-40</td>
<td>15-18-18</td>
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<td>6-1-11</td>
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<td>10-32</td>
<td>21-45</td>
<td>32</td>
<td>15-5</td>
</tr>
<tr>
<td>11-16-11</td>
<td>22-4-10</td>
<td>43</td>
<td>15-6</td>
</tr>
</tbody>
</table>

**Mass U = 10.4 kg**

**Critical water ht 91.3 cm**

---

**START-UP CHECK LIST**

- **Equipment:** Checked by ____________
- **Personnel Check:**__ ____________
- **Surface Check:**__ ____________
- **Emergency Equipment:**__ ____________
- **Red Light:**__ ____________
- **Start-Up Check:**__ ____________

---

**Loadings:** Same as 19-1, except fuel plates 1-3, 12-13, 15-18. Amended from Slot 12.

**Miscellaneous:** Boxes 3, 11, 35 set correctly, and replaced with 35.

**Special Note:** Will work at 1000 rpm, and check fuel, fuel feed.

---

It was discovered on this run that in boxes 8, 10, 14, 18, 28, 32, 34+38 slot 9 contained a paper plate, instead of paper plates as specified in loading 19-1. This had the effect of making the reactor super critical.
Critical Conditions

Log N 1.0

Control Blade 15.73

Control Rod 29.01

$R_1$ 6.35 x 100 x 1000

Water Ht. 109.2

Water Temp 73.5

Loading Sensors 19.3

End Boxes on Bottom, Not on Top


Jack Point

Top 8
10
13
15
21
34
42

Payload 5.9
6.2
6.5
6.7 Bottom
LOADING: Some slots have been loaded.

SLOT: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
SERIES: 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
TYPE: T T T T T T T T T T T T T T T T

SLOT: 17 18
SERIES: 2 10
TYPE: 1 1

NOT CRU

SUPER CRITICAL WATER HEIGHT 96
TEMP 73°F
### Slot 12 Loading for EXP 20-1

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<tr>
<th>Box</th>
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### Critical Conditions

- **Water**: 71 F, 19 Water Temp 72.5
- **Log A**: 11 Control Rod, 20.42
- **DC**: A (80) Control Blade 8.8, 3
- **R1**: 1 H + 0.1 (100K, 300K)
CRITICAL CONDITIONS
WATER HT/IN 119 WATER TEMP 72.5
DC-1 OPP SCALE R-1 OPP SCALE
LC-1 N OPP SCALE EXP ROD 19.01
DC-2 CL (20x10) EXP BLADE 11.79

LOADING: SAME AS 20-2 WITH GOLD FOILS AS NOTED BELOW

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<tr>
<th>Foil</th>
<th>Plate</th>
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</table>

Text continued on next page:

Time started at 12:34:25

Time ended at 13:52:25
LOADING: SAME AS 20-4 EXCEPT FUEL PLATES 4-38; 5-12; 5-16 IN BOXES 38, 8, 36 RESPECTIVELY IN PLACE AT 55 IN SLOT 12.

A start attempt was made at 11:49 AM, and only Stab 4-37 in slot 38 and fuel plates 4-37 in slot 38 and 8 were not rotated. Log reading was 0.02, a factor of 100 below fuel flow. The two extra fuel plates were added to fuel flow 38 and 8 in place of 55. The new fuel was not released after the start attempt due to a false start.

CRITICAL CONDITIONS
TIME CLOCK STARTED 11:29
TIME FUEL HAD 11:49
LUG No. 2 11:49
DC-2 60 109
DC-3 60 109
CONTROL ROD 29.02
CONTROL BLADE 7.6
(QUER)
LOADING. Same as for 20-S with foils loaded as noted below.

Caesium 137 on plate 8, B-16 plate 14 between plates 19 & 15.

- J-40 - N-9 - 12 - 15 - 18
- J-36 - N-11 - 16 - 19 - 17
- J-36 - N-12 - 16 - 19 - 18
- J-36 - N-14 - 16 - 17 - 17
- J-36 - N-12 - 16 - 19 - 17

Start clock at 16:41:00 ± 0.94 on log N.

Reactor scrammed at 17:01:00.

Water HT, 109, water temp 43°F.

Log N: 20

EVT. Rod 29.02

DC-2: 68 (10:20) final blank 10:77
### Instrument Check

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<tr>
<th>Date</th>
<th>Time</th>
<th>Instrument</th>
<th>Source No.</th>
<th>DC 6</th>
<th>DC 12</th>
<th>DC 50</th>
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</table>

### Startup Check List

- Equipment checked by: [Name]
- Personel checked by: [Name]
- Instrument and Motions checked up ERR by: [Name]
- Source of ERR checked by: [Source No.]
- Emergency instrument or control room checked by: [Name]
- Rod Light On by: [Name]
- Start-up OK by: [Name]

---

**Loading Same As In 20-8 Except 55 12-86 In Place Of 516 In Slot 12 Box 86**

**Gold Foils Loaded As Noted Below.**

- Bare Au Foil: J-31 on Plate 11-14 Box 23 Slot 28, between slots 24-3
  - J-34
  - J-35
  - J-36
  - J-37
  - J-38
  - J-39
  - J-40
- Bare Au Foil: J-31 on Plate 11-14 Box 23 Slot 17, between slots 24-3
  - J-34
  - J-35
  - J-36
  - J-37
  - J-38
  - J-39
  - J-40

**NORM**
- Bare Au Foil: J-31 on Plate 11-14 Box 23 Slot 17, between slots 24-3
- Bare Au Foil: J-31 on Plate 11-14 Box 23 Slot 28, between slots 24-3

**Ca- served**
- J-51
- J-34
- J-35
- J-36
- J-37
- J-38
- J-39
- J-40
- J-41

**CLOCK STARTED 7:12 PM**

- Screw
- Water HT 169
- Water Temp 69°F
- Log N 2 DC 1 87.8 (5/10)
- Blade 0.08 Rod 14.03
Setup: 40-7  
Time: 0456  
Data: 12 Jan. 106

Purpose:
Time Structure of Core Dispersion

Falls in box 11-23

Personnel: AB, AT, JG

---

START-UP CHECK LIST

Equipment Checked by: RA  
Personnel in Check List: AB

Instrument and Safety Devices and Dampers: RA

“Source In” Checked by: RA

Emergency Equipment 1: Control Room, back-up 2: RA

Red Light 6 by: RA, red

Start-up on 5 by: RA, Tuesday, 12 Jan. 1966

---

Operating fuel #16 on Fuel Plate II-21 in Slot 10 Box 23

" #2 Boron plate " 9 "

" #3 Fuel plate II-19 " 8 "

" #4 " #5 " 7 "

" #6 " #7 " 6 "

" #8 Boron Plate " 4 "

" #9 " Fuel Plate II-18 " 3 "

" #10 " #11 " 1 "

" #12 " #13 " 16 "

" #14 Boron plate " 14 "

" #15 Fuel plate 11-16 " 15 "

Clock started at 10:37:13 PM

Critical Conditions:

Water Level 1975  
De-2 89.55 cc  
Control Rod 290 cc

Log N 2.0  
Water Temp 69°

Rd 4.610000000
Loading - Same as 20-1, page 136.

Critical Conditions:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddle</td>
<td>16.28</td>
</tr>
<tr>
<td>Rot</td>
<td>27.02</td>
</tr>
<tr>
<td>Wt</td>
<td>105.4</td>
</tr>
</tbody>
</table>


In order to approximate as closely as possible the run 209, the assembly was started at key N = 1.8, since the clutch was started at 1.74 (0.9%), it was well to assume 10 seconds earlier, than the clutch would have been for a 30 minute run, thus keeping the time interval between the start of the run for N = 1.8, and the finished run, 20 minutes. 300 Seconds being the period between 1.8 and 2.0.
Critical Conditions

Log IV 16
DC. 89 2848.5
Ref. 6.3 1000000
Water Temp 69

Loading: Same as 10-11
Catcher foil plate is in Box 23, Slot 11, in place of full fuel 11-25

<table>
<thead>
<tr>
<th>Catcher Foils</th>
<th>Position (in vertices center of Core)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>+10</td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>+6</td>
</tr>
<tr>
<td>24</td>
<td>+9</td>
</tr>
<tr>
<td>41</td>
<td>+2</td>
</tr>
<tr>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>01</td>
<td>-2</td>
</tr>
<tr>
<td>19</td>
<td>-9</td>
</tr>
<tr>
<td>142</td>
<td>-6</td>
</tr>
<tr>
<td>143</td>
<td>-8</td>
</tr>
<tr>
<td>144</td>
<td>-10</td>
</tr>
</tbody>
</table>

START-UP CHECK BOX
Equipment Checked by DM
Instrument and Side Lines Checked and Signed by WP
"Source for" Checked by GM
Emergency Oarings in Critical Boxes Checked by RS
Bag Lights On by RS
Start Up OK by RS

Exp. 19-5
Time 650
Date 4 June 1966
Purpose: Adequate power to Distribution 2 Bayen
Permit: RF JL OD
Check started at 7:17:18’.

Critical Conditions:

Log N: 2.0
OC: 2 58.1040
QC: 1 6.4 1100 amp
Water Temp: 67°F

Start-up OK at 11:15.

Reactor Check List
Equipment Checked by: Flame
Environment and Filter Check by: Flame
Emergency Ignition by: Flame

Loading: Same as 10-10 except 515 has replaced 616 in slot 12, box 10.
4 11-17, 14-9 have been 96-10 at 12 instead of 95.
Also the following fuel plates have replaced the fuel originally in these slots:

- Data on plate from readout along diagonal:
  - 61-4 plate 510, fuel B-11
  - 61-4 plate 615, fuel B-11
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125
  - 61-15, plate 415, fuel B-125

Standardizing fuel 610 on holder 41.

Note: Reactor was very subcritical at first trial. We then added fuel plates 11-17 11-12-4 are making a second trial. The reason for the low reactivity of the core is not certain - the core was checked for possible leaks. No leaks found. Log N got up to 0.1 on first trial but for a very short period of time.
10.31 AM.

Run conditions:
- \( \text{B} \) = 9.14
- \( \text{R} \) = 29.02
- \( \text{W} \) = 109.5 cm

Log N = 2.0
- \( \text{DC-2} \) = 61 (10×10)
- \( \text{R-1} \) = 6.6 (1000×1500)
- Temp = 65°F

Log N can now be checked calibrated every day by the following procedure:
- Lay the B-source on top of the can so that the source is touching the thin-wire housing the light chamber. In this position, log N should read 0.09.

START-UP CHECK LIST
- Equipment Checked by: \( \text{M} \)
- Personnel Check by: \( \text{M} \)
- Instrumentation and Calibration Check by: \( \text{P} \)
- Emergency Monitor by: \( \text{M} \)
- Red Light Check by: \( \text{M} \)
- Start Up OK by: \( \text{M} \)

Loading = same as 20-19, plus 150 except 5-16 has replaced 61 in slot 14, box 46. plus tube plate 4-19 in slot 12, box 13.

Reader just critical, water up, blade up.
Log N = 0.1
Loading: Mass-voice # run 19-7 plus two full plates

<table>
<thead>
<tr>
<th>Box Slot System</th>
<th>Blade</th>
<th>Foil</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>618</td>
<td>D-212</td>
</tr>
<tr>
<td>5</td>
<td>619</td>
<td>206</td>
</tr>
<tr>
<td>15</td>
<td>614</td>
<td>216</td>
</tr>
<tr>
<td>10</td>
<td>613</td>
<td>214</td>
</tr>
<tr>
<td>16</td>
<td>615</td>
<td>209</td>
</tr>
<tr>
<td>10</td>
<td>621</td>
<td>210</td>
</tr>
<tr>
<td>5</td>
<td>616</td>
<td>201</td>
</tr>
<tr>
<td>10</td>
<td>512</td>
<td>208</td>
</tr>
<tr>
<td>5</td>
<td>617</td>
<td>217</td>
</tr>
</tbody>
</table>

Ve power at 8:22:40
20 min exposure.

Run condition:
- Rod: 0.47
- Blade: 0.902
- Water: 0.004
- Temp: 69.2°F

For slot 12, see page 187
Box 23, see page 187
Box 10, see page 137