Opportunity Based Training

at the LBNL 88-Inch Cyclotron

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Operations Supervisor

88-Inch Cyclotron

Lawrence Berkeley National Laboratory

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The 7th International Workshop on Accelerator Operation

Opportunity Based Training

The 88-Inch Cyclotron Operation

- The 88-Inch Cyclotron is a small facility
  - staff of ~ 24 FTE (4 Oper., 10 Techs, 3 Eng, 7 Ops Grp.)
- The Cyclotron runs ~ 93% availability.
- Scheduled operation of ~ 5000 hours a year.
- Operates on a 10-4 cycle, 24 h/day, 2 long shutdowns/ year.
- We support LBNL nuclear science research program (60%) and our applied science program for the Aerospace industry radiation effects testing (40%).
- 88-Inch has managed to survive by continuing to do important nuclear science research and applied science with a steady program of upgrades and by adjusting to our user's needs.

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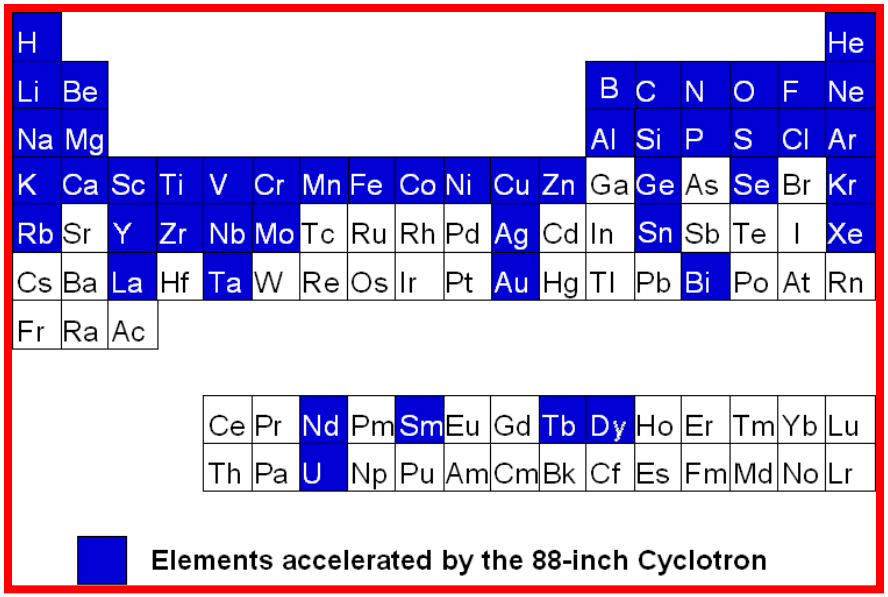
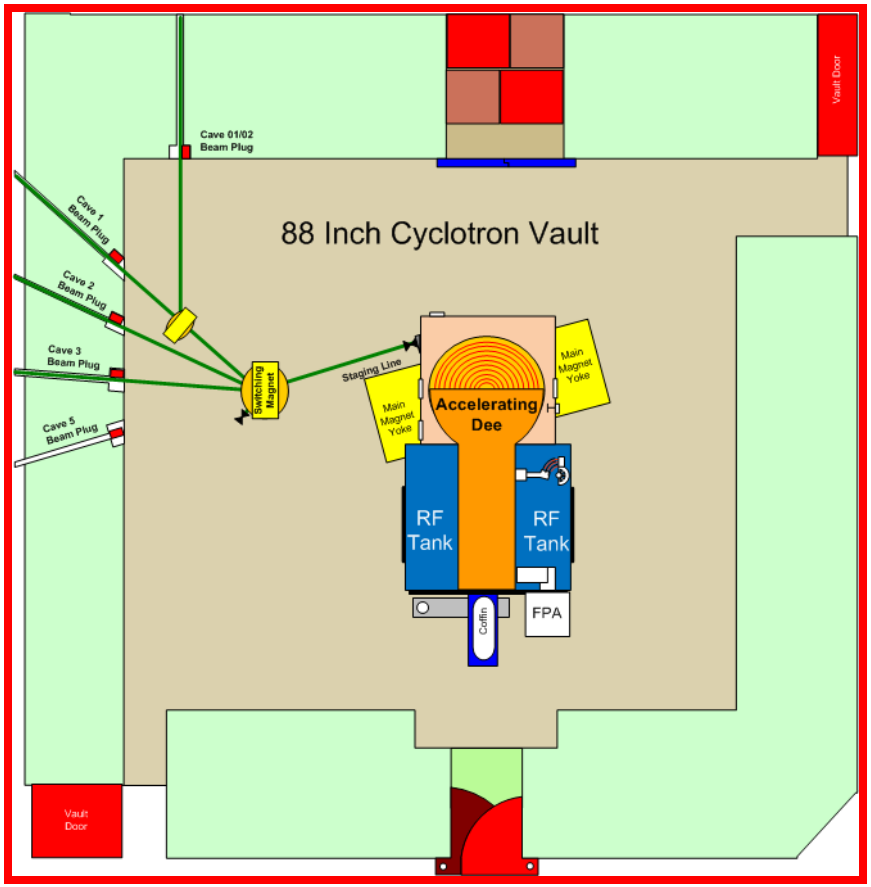
Overview

- The Cyclotron's layout
- Variable frequency RF Tank
- Accelerate every element from Hydrogen to Uranium at various energies





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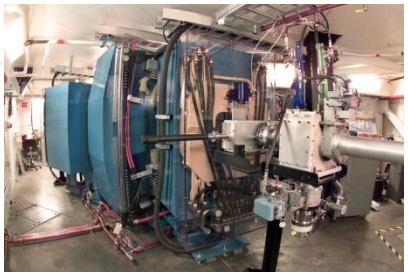
88-Inch Cyclotron Complex Experimental Facilities

Cave 4C GRETINA/GRETA

Heavy Ion Facilities

Cave 1 BGS



BASE

Light Ion Facility

Cave 0, Isotope production
Applied and Nuclear Science
Neutron Facility

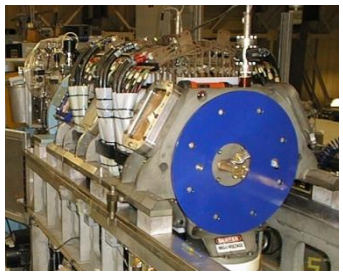
88-Inch

Laser Trapping

LIBERACE

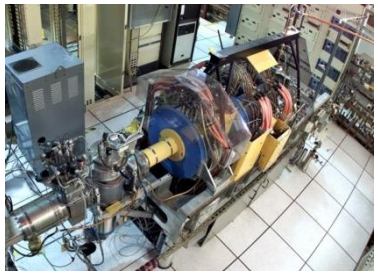
The Berkeley ECR Ion Source Program

- The 88-Inch Cyclotron's flexibility is due to having one of the premier ECR Ion Source programs in the world.



6.4 GHz

VENUS 18+28 GHz



AECR-U 10+14 GHz

88 - Inch Cyclotron

Opportunity Based Training

Training Challenges at the 88”

One Operator/Shift- Operator must be independent and confident in their ability to handle the machine.

No dedicated training staff- Operators train Operators.

No dedicated training facility or elaborate training aides.

Low Turnover – New Operator ~ 2-3 years.

The Skill of the job is Tuning – Tuning is Hands On

We have 6 month to determine if the trainee will make it.

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Objective of Training at the 88-Inch

- To train an Qualified Operator in 9 months.
  - Standing supervised shifts in 1 month
  - Safety, Theory, Systems, Procedures, Skills
  - Take all the required institutional training
- To instill independence and confidence.
- To develop effective troubleshooting skills.
- To end up with an Operator that assumes ownership of the machine's performance.

Opportunity Based Training

The opportunity base training scheme is an intensive sort of training where the trainee is placed in learning opportunities based on the facility schedule.

The trainee:

- learns the theory, systems and procedures while working on the machine under supervision.
- sees the actions taken by the operator and learns cause and effect as it happens.
- sees the application of the theory, the interconnectedness of the systems and the sequencing of the procedural steps.
- is routinely doing the standard tasks of an operator on shift, i.e. taking logs, doing rounds, preparing for tunes and doing tunes.

Opportunity Based Training

The basic training sequence is:

Trainee:

- **is assigned to a task and prepares to do the task.**
- **watches the operator do the task and learns the task.**

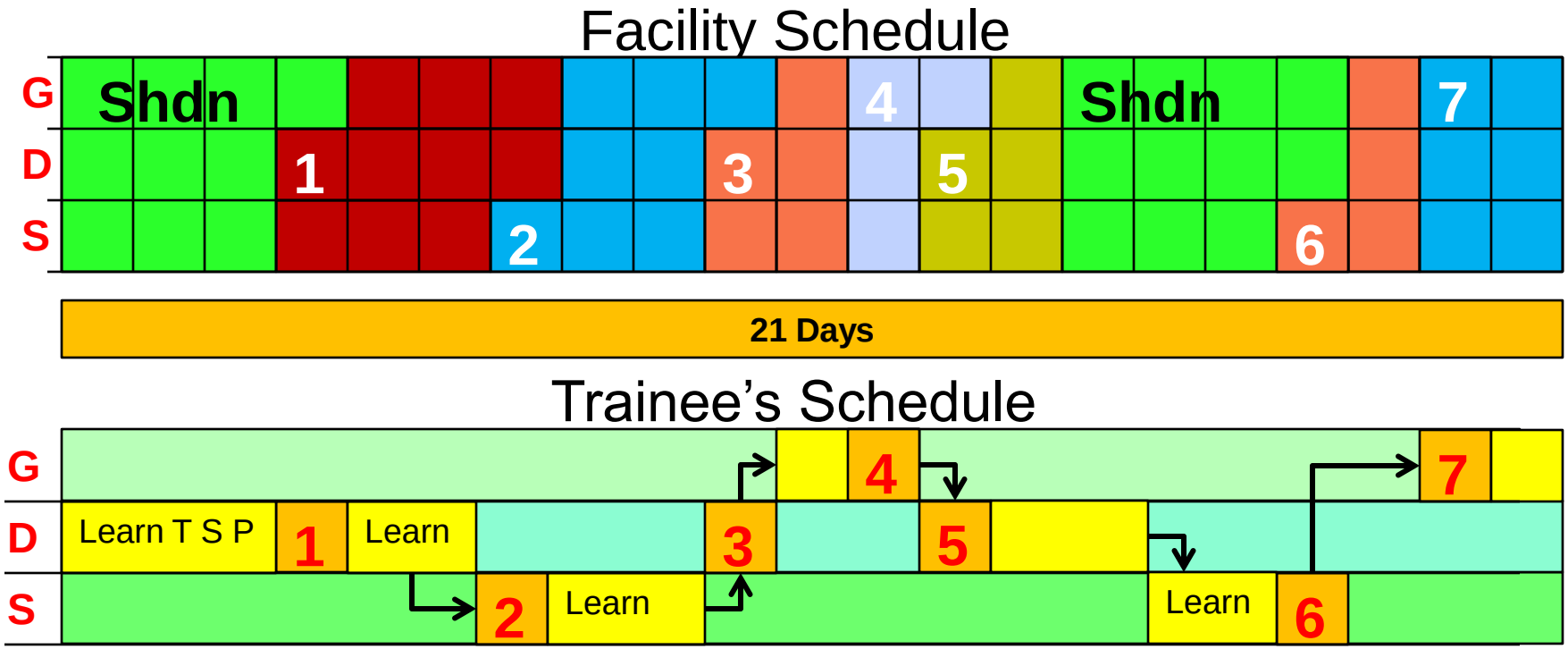
Then does the task.

- **is supervised and challenged to explain actions.**
- **Is motivated to improve performance each time.**

The trainee is put in the situation to perform under the time constraint of knowing that the users are waiting for the beam.

The process repeats by assigning the trainee to the next task.

Opportunity Based Training



Opportunity Based Training

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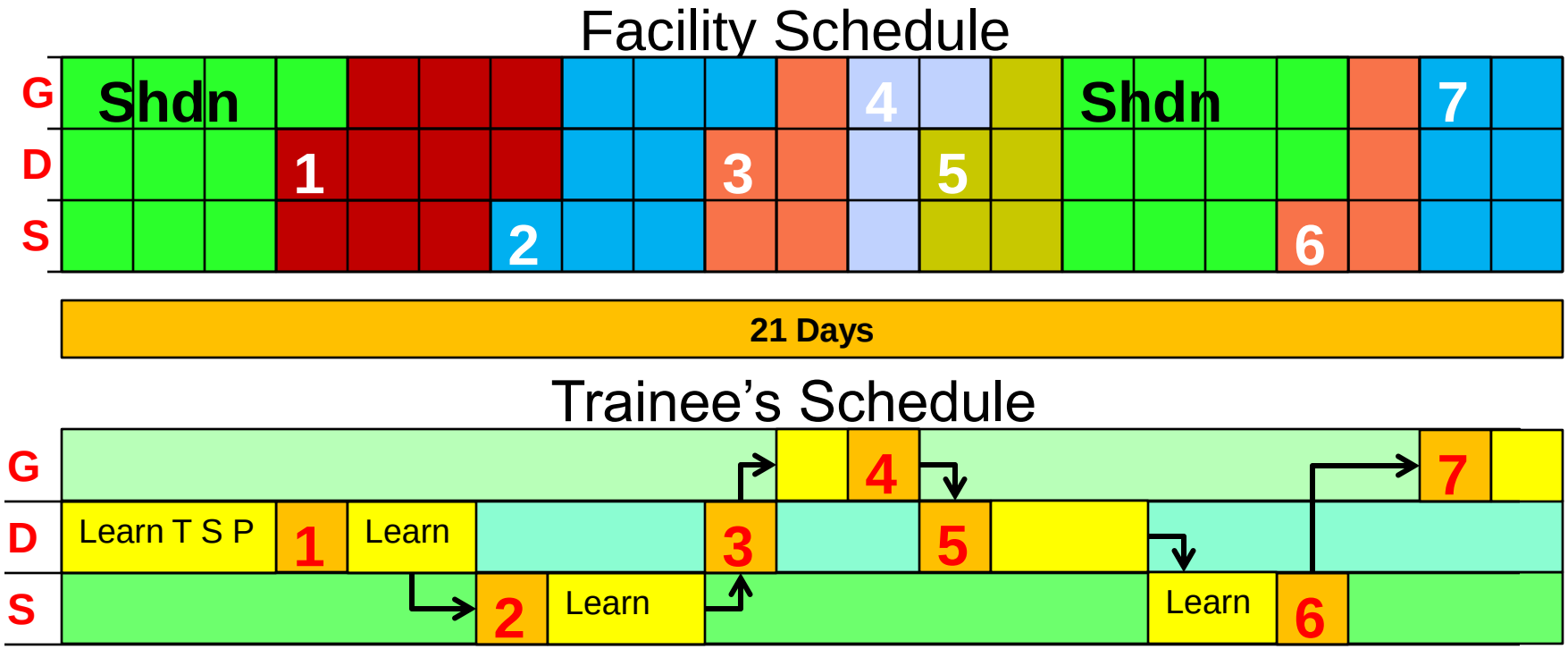

In this 21 day period the trainee has worked on 7 tunes,
has worked with three different operators and
has worked in the control room on all three shifts.

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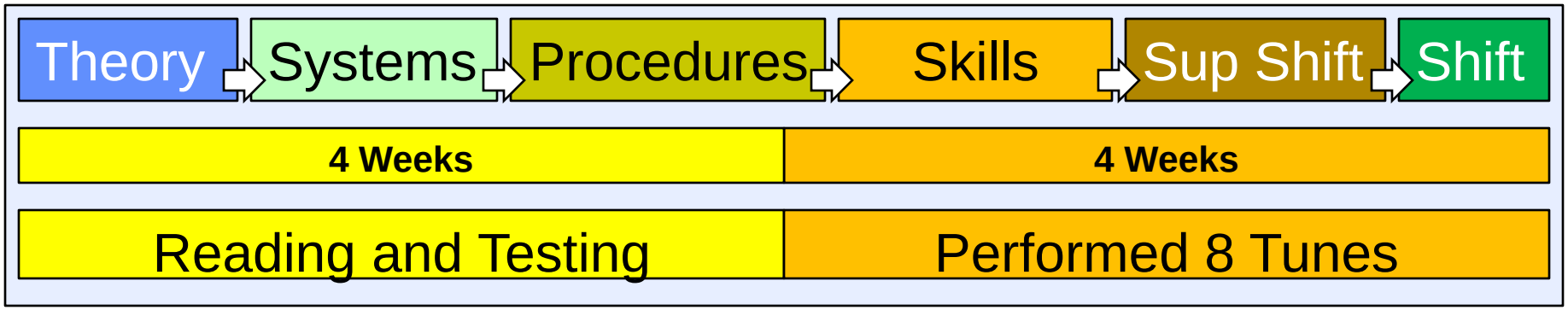
Conventional "Linear"Training



Facility Schedule

88" Trainee Training Experience

Performed 18 Tunes
Spent 8 weeks working with Operators in the Control Room

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The high performance expectations is a strong motivator to get relevant answers to specific questions - this way the learning is more effective and is directed to the trainee's needs.

In this method the trainee is forced out of their typical learning comfort zone.

- They are not in a classroom.
- Their schedule is jumping from shift to shift.
- They are immersed in the real world of an operator.
- They have to participate in solving problems with limited information.

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The determination of comprehension and competency is accomplished by:

- Demonstration of comprehension during interviews and during task completion (no specific tests).
- Observation of performance (setups, tunes, failure response).
- Completion of specified tasks (typical shift tasks).
- Standing shifts without need for supervision.
- Demonstration of improvement in skills.

When the qualification list is completed the trainee is qualified.

Opportunity Based Training

Advantages of Opportunity Based Training

- The trainee does not spend time learning abstract things, the relevance of which will be explained later.
- They learn the location of systems and controls because they are touching them and adjusting them.
- The trainee sees the techniques of each operators and sees the effectiveness of each operator's process.
- The trainee is forced to build an effective model of the machine because as they are doing the work their understanding of the machine is continually being challenged.

Opportunity Based Training

Advantages of Opportunity Based Training

- The trainee effectively learns procedures by doing the steps because they see the cause and effect of their actions.
- The trainee sees the entire scope of the work of an operator.
- The trainee is regularly placed in situations with demands on them to perform at a high level so they learn to deal with it.

- We are able to evaluate the trainee's performance and understanding before the 6 months are up.

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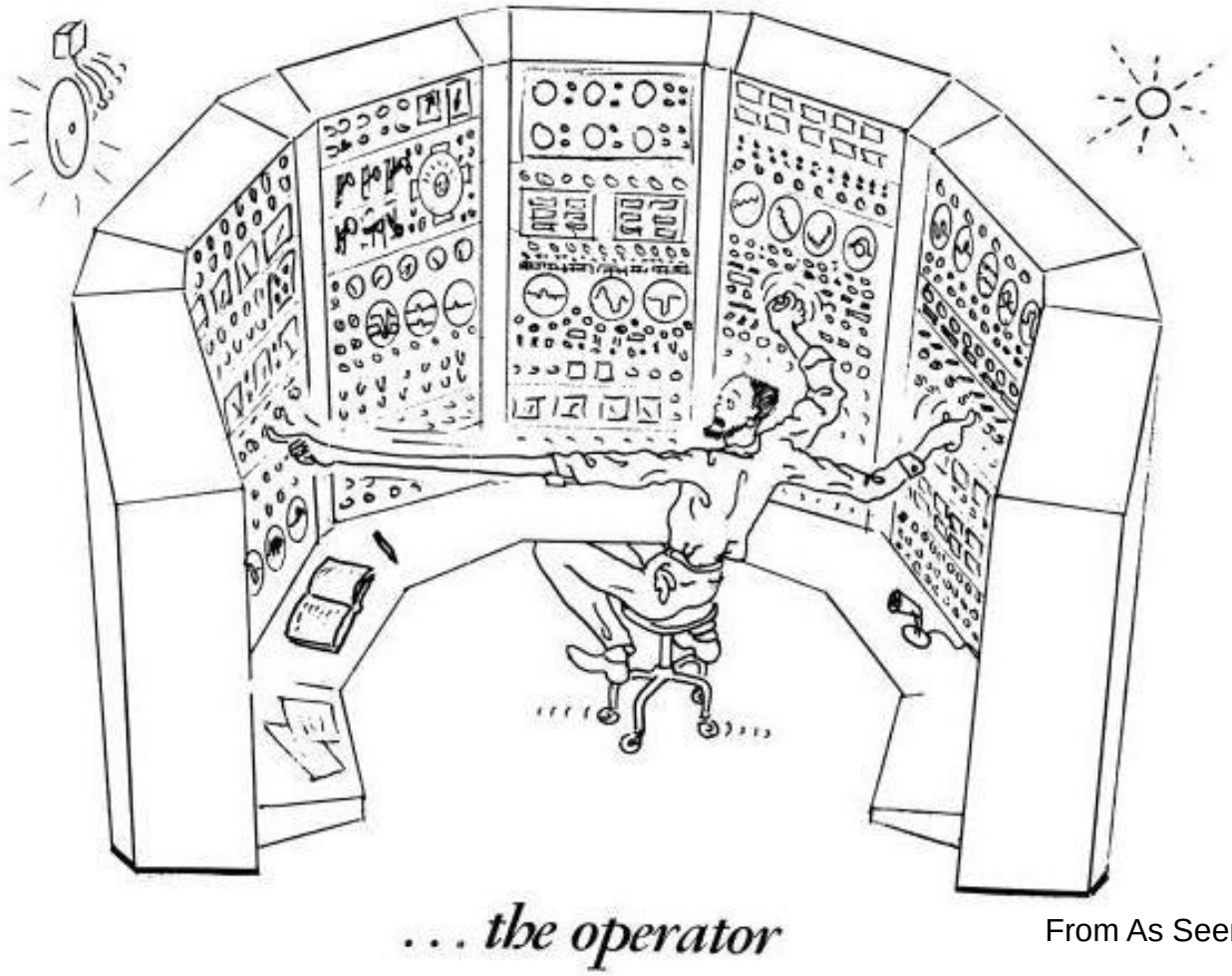
Summary

From the very beginning this training process:

- allows the operator learn effectively.
- allows the operator to test their understanding.
- forces the operator to function in the control room.
- allows the operator to develop confidence in their skills.
- allows the operator many opportunities to significantly improve their performance and to develop a pride in the quality of their work.

This training process leads to independent, confident, capable, qualified Accelerator Operator in the needed time.

Opportunity Based Training



From As Seen By

We would like the classic SUPER Operator.

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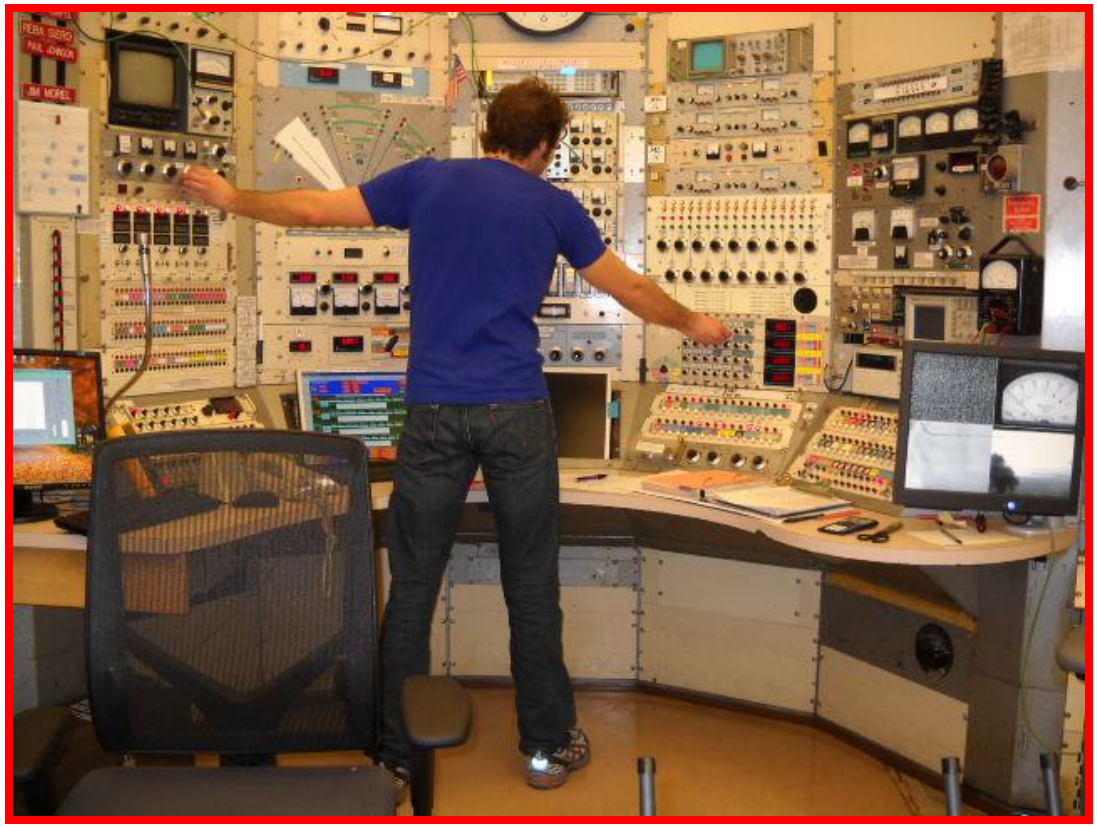
But we would rather keep our newest Operator.



Paul Johnson

Hired:	May 2009
Tuning:	Jun 2009
On Supr. Shift:	Aug 2009
Qualified:	Jan 2010
On Shift:	Feb 2010