FermiNews

February 27, 1987 Vol. X, No. 4 Fermi National Accelerator Laboratory

First Collider-Mode Accelerator Startup Goes Well

by John Crawford and Bob Mau

In these early stages of the 1987 Collider-mode engineering run, it is perhaps appropriate to look back over the last year and assess where we have been, where we are now, and make some guesses about where we are going.

It has been 15 months since the Accelerator was shut down for a long nine-month civil construction period (time flies when . . .); that last run ended on October 13, 1985, at 0530 with the historic news that the Collider Detector Facility (CDF) had recorded 1.6-TeV proton-antiproton collisions. The euphoria was short-lived. The realization set in that there were going to be major upheavals in the Accelerator systems, that several large construction projects were beginning just as winter was making its appearance, and that we had committed to a startup schedule that left little room for miscalculation.

First, let's consider some of the major projects undertaken during the shutdown:

1. Construction of the D0 Collider Detector building.
2. Construction of a 21-ft-high overpass to carry the Main Ring beam above the B0 detector.
3. Change the Booster controls from the old Xerox 530-based system to the VAX system that the rest of the Accelerator was running on.
4. Upgrade of the 13.8-kV feeder system throughout the Accelerator.
5. Installation of Z/n plates (microwave instability dampers) at each Main Ring magnet.
6. Installation of the Booster to Debuncher beamline (the AP-4 line).
7. Installation of several "small" collider experiments in the Main Ring tunnel at B0, C0, and E0.
8. Rebuild approximately 500 Main Ring correction magnets.
9. Installation of a completely re-designed 8-GeV line (the Booster to Main Ring transfer line).
10. Construction of an experimental area at AP-50 in the Pbar Source.
11. Dismantling the entire refrigeration system between A4 and B1 (including refrigerator buildings) and then re-assembling the system once the B0 Overpass was completed.
12. Installation of 12 new transformers for the TEVATRON power supplies, and rebuilding 286 Main Ring and TEVATRON power supplies.

In addition to these major projects, literally hundreds of smaller improvements were made, each with its own requirement for de-bugging during the startup.

So, how has the startup gone? Well, we actually began bringing systems up around January 17, 1986, when commissioning of the AP4 beamline began. By the end of January, the line was being routinely used to provide protons to the Debuncher Ring. (It is worth noting that the protons were circulated in the same direction as antiprotons would normally travel, so the polarities of most devices in the ring had to be manually reversed, then reversed again for antiproton production.) Booster and Pbar Source studies continued until May 1, when installation of the new Booster control system began. Booster and Main Ring startup began on July 18, with 8-GeV beam achieved in the Booster by July 27th. The next step was to commission the new 8-GeV line; this

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SSC Site Selection Scheme Set

Secretary of Energy John S. Herrington has announced the timetable for designating "a preferred [SSC] site." At a press conference held on February 10, the Secretary stated that the governors of interested states will be invited in April to submit site proposals. The Department of Energy will screen applications by November and submit those that meet technical criteria to a panel of experts appointed by the presidents of the National Academy of Sciences and the National Academy of Engineering. The panel will be asked to reduce the list to "a small set of the most excellent proposals" by the end of 1987. From that small set, Secretary Herrington will choose a preferred site by July 1988, with final selection scheduled for January 1989.

"Startup" continued from page 1

began on Friday, August 1, and beam was transported to the C0 abort dump by Monday, August 4. (Due to the continuing construction work, commissioning was carried out only on weekends. Because the tunnel was still open at D0 for the collision hall construction, beam had to be stopped at C0.) By August 11, a few turns of beam had been circulated in the Main Ring, but the next three weeks provided nothing but frustration for the tuners as coasting beam could not be established. Finally, a concentrated obstacle search yielded a garbage bag and a plastic beampipe cover - coasting beam followed on September 2. Main Ring beam was accelerated to 120 GeV by September 8, and cooldown of two sectors in the TEVATRON had begun.

TEVATRON power supply testing began on September 11, but all sectors were not cooled down and ramped until October 8. TEVATRON-accelerated beam was achieved on October 14 and beam was stored at 800 GeV by October 20. Antiproton stacking had begun in the Accumulator by November 12; by November 26, antiprotons had been reverse-injected into the Main Ring and accelerated to 150 GeV. On Sunday, November 30, antiprotons were accelerated to 900 GeV, stored, squeezed, and collided with 900-GeV protons.

By now, all was ready for the CDF detector to be moved into the collision hall during the week of December 15; however, a small setback occurred on December 7 when a high-field quench in the TEVATRON ruptured the cryostat of the E27-4 dipole, requiring the eventual replacement of four magnets. Once the CDF detector was in place, much work remained to be done on the gas systems; these required frequent accesses into the collision hall until about January 7. Collider commissioning began in earnest on January 10.

Where are we now and what remains to be done? The TEVATRON is now being filled twice per day. Each fill consists of three antiproton bunches and three proton bunches. Each antiproton bunch is formed by transferring a batch of antiprotons, consisting of 10 or 12 bunches, from the Accumulator to the Main Ring where they are accelerated to 150 GeV and then coalesced into a single bunch just before transfer to the TEVATRON. Three successive supercycles are used to form the X, Y, and Z bunches. On the fourth supercycle the proton bunches are formed using a similar sequence: A batch of protons, consisting of 6 to 8 bunches, is extracted from the Booster and injected in the Main Ring. After acceleration to 150 GeV, these bunches are also coalesced into a single bunch and transferred to the TEVATRON. Three successive Main Ring cycles within the supercycle form the A, B, and C bunches. Several 10-hour stores have been achieved. While luminosity and beam quality are not as good as we would like, there is reason to be optimistic. The set-up time for transfers also seems to be decreasing despite glitches. The antiproton stacking rate has reached 9- to 10-billion antiprotons per hour. While this is below the 100 billion per hour called for in the design, it already exceeds the best achieved at CERN. The size and duration of the $\bar{p}$ stack is also increasing - we have attained a maximum of 150 billion antiprotons in the stack and this particular stack was stored in the Accumulator for 14 days before it was accidentally dropped. (For reference: the longest CERN has been able to maintain a stack has been 41 days.)

What does the future hold? For the very near term, CDF will be turning on their central tracking chamber and the Accelerator will be scheduling three $\bar{p}$ transfers per day instead of two. There are ongoing efforts to improve Main Ring efficiency, $\bar{p}$ stacking rate, and transfer efficiency all through the reverse injection, store, squeeze, and cogging operations. In the slightly longer term, we would like to see the whole colliding-beams operation change from a wild adventure to a somewhat dull routine.

Of course, far off in the hazy future lies another 800-GeV fixed-target run, with its own set of problems to be overcome. Stay tuned. . .

Recent Retirements

Richard H. Isiminger

Rich came to Fermilab as a technician in the Conventional Magnet Facility in 1974. For the past ten years he has been in charge of Operations at Industrial Building #2. Jack Jagger said of Rich, "He has worked hard to make our group a success. His cooperative attitude, job expertise, and dedication to getting the job done will be missed. I personally have enjoyed working with Rich and have great respect for his abilities. All of us in Technical Support wish Rich the best."

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Number of professional ping-pong players in China: **600** - from *Harper's* Index

Benefits Notes

Partial Withdrawals - TIAA-CREF SRA's

If you have TIAA-CREF SRA's, you can make partial withdrawals from SRA's as often as once a month provided at least $1000 is withdrawn. (Formerly partial cash withdrawals in amounts of at least $1000 could be made once every six months.) Keep in mind withdrawals made before age 59-1/2 or before retirement at age 55 are subject to income tax plus a 10% penalty.

TIAA-CREF - Earnings and Benefits Up

CREF's net rate of total investment return for calendar 1986 was 22.0%, again outpacing the S&P 500 Stock Average, which had a return of 18.3% for 1986. Fund officials noted that CREF's annualized total net investment return for the five years ending December 31, 1986, was 21.1% compared to 19.7% for the S&P 500 Stock Average. Over the last five years, CREF annuity income benefits for retired participants have risen some 88%.

Fidelity - Investment Results

A copy of Fidelity's family of funds investment results for the period ending Decmeber 31, 1986, is available from the Benefits Office. For a copy call ext. 3395 or 4361.

Maxicare

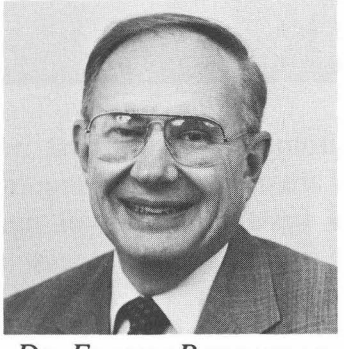
Maxicare announced that they will join the industry in adopting the new Coordination of Benefits (COB) rules set by the Association of Insurance Commissioners. As of January 1, 1987, Maxicare will comply with the "birthday rule" and the other new rules to determine which plan pays first. A description of the new COB rules can be found in the January 30, 1987, issue of *FermiNews*.

Medicare Sign-up Period

The general enrollment period for the medical insurance part of Medicare (Part B) runs from January through the end of March. The enrollment is for people who passed up the chance for this protection or who had it and dropped out. Protection for people who sign up during the general enrollment period will start next July 1. More information about Medicare can be obtained from your local Social Security Office. **- Paula Cashin**

Talk About the Weather is Topic at Next Fermilab Lecture Series

Weather forecasting - is it a magic art or a science? Now the Fermilab Lecture Series is joining the debate. Dr. Eugene Rasmusson will bring us up to date on recent progress, and describe important successes, such as the prediction of the south Pacific warming, known as El Nino, which is now taking place. In his lecture, "Weather and Climate: Predictable or Mother Nature's Dice Game?," Dr. Rasmusson will describe how meteorology has developed from an art to a detailed science, and the prospects for forecasting Chicago's notoriously changeable weather. This program will take place Friday evening, March 6, 1987, at 8:00 p.m. in Ramsey Auditorium.



Dr. Eugene Rasmusson

Eugene Rasmusson is a distinguished meteorologist who served for many years in the National Weather Service and the National Oceanic and Atmospheric Administration, and until recently as Chief of the Diagnostics Branch of the Climate Analysis Center in Washington, D.C. He is now a Faculty Research Associate in the Department of Meteorology at the University of Maryland, and a consultant to NASA and the World Climate Research Program.

Dr. Rasmusson has authored many scientific papers, including several on the El Nino phenomenon, and has received numerous scientific honors. Admission to Dr. Rasmusson's lecture is $2, $1 for senior citizens. To reserve tickets, or for further information, call ext. 3353 weekdays between 10:00 a.m. and noon or 1:00 p.m. to 4 p.m. **- Dan Kaplan**

Next R&D Seminars

S. Bracker, "E-769 VME-based Data Acquisition System," March 3, 1987, 11 a.m. S. Hansen and M. Bernett, "Fermilab Smart Crate Controller," March 10, 1987, 11 a.m.; both will be held in Curia II.

Paula Garrett Takes the Helm of the Fermilab Library

Paula Garrett, Fermilab's new librarian, joins the Lab with five years of library experience at Rice University. She plans to use that experience to get the Fermilab Library "on-line."

Paula Garrett

Library automation is the first item on Paula's agenda. Plans are under way to acquire an integrated on-line library system which will run on the VAX and provide user-friendly access via terminals throughout the Lab. The objective of such a system is to enhance user access to various library records.

When the total system is up and running, some of the main features will include a public catalog containing bibliographic records of the library's book and periodical titles accessible by author, title, subject, and keyword; circulation status; records of items on order; and access to the library's records of periodicals with up-to-date information on issues received and bindery status. Easy interface with the high-energy physics databases provided by SLAC is a top priority.

Currently, the Library has access to three outside computerized systems: 1) SLAC High Energy Physics databases, 2) Dialog, a major vendor of commercial database systems, and 3) OCLC, a shared cataloguing and interlibrary loan system. Also available is Pi-Net, the Physics Information Network. For more information, contact Paula: "Library" on the VAX, or call her on ext. 3401.

- S. Winchester

*[**NOTE:** Included with this issue of* FermiNews *is a survey from the Library intended to gather information on who uses the Library, and how collection and services can be expanded/improved.]*

Congratulations to:

Michelle and David *(Accel/Ops)* Johnson on the birth of Sarah Elizabeth on December 7, 1986, at Delnor Hospital. Sarah weighed 8-1/2 lbs., and was 20 in. long. Awaiting Sarah at home was brother Michael.

Charletta and John *(EE Support)* Brown on the birth of Janean Marie on January 12, 1986, at Copley Hospital. Janean weighed 5 lbs., 5 oz., and was 18 in. long.

Betty and Juan P. *(E-710)* Negret on the birth of Andrea, on January 15, 1986, at Copley Hospital. Andrea weighed 7 lbs., 10 oz., and was 19-1/2 in. long. Big brother Marcel welcomed Andrea home.

Itsuko and Victor *(EE Support)* Martinez on the birth of Tashio Abrahm on January 4, 1987, at Mercy Hospital. Tashio weighed 7 lbs., and was 20 in. long. Tashio joins brother Kiyoshi at home.

Karen and John *(ES/Cryo)* Thompson on the birth of Jacob Boyd on February 9, 1987, at 9:41 p.m., at Copley Memorial Hospital. Jacob weighed 7 lbs., 5 ozs., and was 19 1/2-in. long.

Fermilab Gets Two Black Belts

Steve Chappa (*CDF*) and Al Haugen (*Machine Shop*) became the first two students from the Recreational Complex karate classes to receive their first-degree black belts. The examination took place in Forest Park last November at Kim's Black Belt Academy and lasted for about three hours. Candidates had to perform a variety of forms, demonstrate self-defense techniques, participate in several rounds of sparring to display their fighting skills, and finally undergo a verbal examination posed by a six-judge panel requiring them to know Korean history and culture. The judges are accomplished martial arts experts including one Olympic bronze medalist in Judo.

Steve began his training three years ago when the classes were first offered; Al trained for several years at another studio before enrolling in the Lab classes about two years ago. They worked out three times a week with the class in addition to exercising and stretching on their own. Congratulations to Steve and Al for their effort in achieving this goal. For more information on the karate classes or any of the other programs offered by the recreational complex, contact Jean Guyer at ext. 3126.

- Mark Leininger

Are You an Occasional Lifter?

The occasional lifter could be anyone who may lift children, shovel snow, carry groceries, handle Xerox/computer paper, bend over to pick up something small, or engage in any activity that might require some type of lifting, carrying, reaching, or pushing/pulling.

Whether you are an occasional lifter or a professional, to prevent injury the same procedures must be followed. However, the occasional lifter may not have been trained in the proper techniques; may not have been realistic about determining the size and weight of the load they can lift safely; and/or their physical condition may not be as good as they think, which leads to more injuries per lift.

Like all tools, the human back requires some care to keep it properly maintained. As part of keeping your back healthy, you need to use your body correctly to avoid loads that unnecessarily cause wear and tear on your back. Body mechanics that will help maintain a healthy back include good posture, proper movement when performing an activity, and avoiding strain. Back maintenance involves many things, but mostly common sense. It's a habit...or a matter of changing habits now. It is up to you.

At Fermilab, back injuries account for 45% of Lost Work Days and 29% Limited Duty Days. Of these Lost Work Days, 95% are from over-exertion and 5% from slips and falls. The Limited Duty Days are 87% from over-exertion and 12% from slips and falls.

When lifting try to follow these steps:

1. Stretch muscles and warm up a little.
2. Plan the lift to see that you have a clear path to where you are going and a place to put down your load.
3. Be realistic about what you can lift and whether you need a helper or mechanical assistance.
4. Stand close to the load.
5. Bend your knee and try to maintain the back's natural curves.
6. Keep a wide base of support. Straddle the load with one foot slightly forward and flat.
7. Look over the object to be lifted.
8. Get a secure grip.
9. Lift with your arms and legs, not your back.
10. Avoid twisting the body as you lift.
11. Take all the above precautions when setting down the load.

For more information about your back and lifting, contact your supervisor. Fermilab hosts a "Back School Program" presented by the Marianjoy Rehabilitation Hospital. This program (three hours) is designed to help develop the knowledge and skills necessary to help you take proper care of your back. For enrollment in the "Back School Program," have your supervisor contact his Senior Safety Officer.

- Gary Andrews

Extracurricular Activities

NALREC Alley Action

NALREC's traditional Candlelight Bowl rolls into action at the Warrenville Bowl on March 21, 1987, at 8:45 p.m. Cost of $12.50/person or $25/couple includes three games of "fun" bowling, door prizes, awards for best male and female bowlers, buffet dinner after bowling. For tickets and information, call Barb Kristen, ext. 3199, Gary Smith, ext. 3878 or Ed Justice P-867.

FILM SOCIETY PRESENTS

On Friday, March 13, 1987, the Fermilab International Film Society will present *The Man Who Loved Women.* The film will be shown at 8:00 p.m. in the Ramsey Auditorium. Price of admission is $2 for adults, $.50 for children. Tickets are available at the door.

Summer Housing Deadlines

The deadline for receipt of reservations for summer on-site housing is Monday, March 2, 1987. Housing assignments will be made in April; responses will be mailed April 10, 1987. The starting date for summer occupancy is June 1. For further information, contact the Housing Office, ext. 3777.

Congratulations to:

Joan and Chuck *(TS/Engineering)* Grimm on the birth of Stephanie Lee on February 15, 1987, at Central DuPage Hospital. Stephanie weighed 7 lbs., 6-1/2 ozs., and was 21 in. long.

Percentage of American households composed of a father who works, a mother who doesn't, and two children: **4**

Percentage increase in waterbed sales in 1984: **30**

- from *Harper's* Index

When Ernie Ernsting Grows Pumpkins, He Grows PUMPKINS

Question: What's round, orange, edible, and weighs 220 lbs.?

Answer: One of Ernie Ernsting's pumpkins.

Better question: How long does it take to eat 220 lbs. of pumpkin pie?

Answer: Ask Ernie's family (and neighbors, and co-workers, and friends, and anyone else who wanted some).

Ernie Ernsting and friends.

Ernie works in the Accelerator Division/ Cryogenic Systems, and has been with Fermilab for 13 years. As evident in the photo above, he likes to grow large pumpkins. These pumpkins are completely edible, although once you start eating a 220-lb. pumpkin, you're not likely to finish anytime soon.

Ernie's first love in gardening is growing hot peppers (he usually grows 300 plants a year) but he also enjoys growing things to enormous proportions. His catcus collection includes a plant that started at 4 inches tall and now stands 6 feet tall. And then there are his pumpkins...

The largest pumpkin he has ever grown was the 220-lb. beauty he grew last year. Unfortunately, it wasn't ready in time for the DeKalb County Fair. He did, however, win 3rd place at the fair for a 178-lb. pumpkin, which was 9 inches thick and 60 inches in diameter.

To grow these pumpkins, which are a mixture of a type of squash and pumpkin, you're obviously going to need a big garden. "They grow from seed to full term in about 120 days, and can gain 10 lbs. in one day," Ernie explained, "The vines themselves grow to about 50-ft. long, and only one pumpkin grows per vine."

Ernie starts his plants in the greenhouse, and then transplants them into his garden as soon as the ground gets warm. They then grow up to the first frost.

The secret to his success is in the care and feeding of these plants. "They drink about 30 gallons of water a day, they need a lot of water and manure." Ernie divulged his secret ingredient by saying, "Chicken manure is the best."

As you can guess, Halloween is a popular holiday around the Ernsting's household. "My wife carves the pumpkins, she's much better at it than I am, although it's not easy for her: she has to use a mallot and pound the knife into the pumpkins to cut out the faces." His wife isn't the only member of the family who enjoys the pumpkins. "My 4-year-old son, Justin, likes to stand in them."

What are Ernie's big plans for his garden this year? To grow a pumpkin weighing over 300 lbs. Maybe we can all go stand in it. **- S. Winchester**

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In The Library

Reproducible 1986 Federal Tax Forms are available from the Fermilab Library in the form of a volume provided by the IRS. Not all tax forms are in this volume. Interested parties may feel free to avail themselves of this service. Check with any of the Library staff.

Credit Checks

Don't forget to circle Wednesday, March 18, 1987, on your calendars! This is the date of the annual meeting of the Argonne Credit Union membership. The meeting will be in Argonne Building 213, beginning promptly at 6:30 p.m. A social hour beginning at 5:30 p.m. will precede the meeting; door prizes will be awarded after the meeting. All members are invited to attend.

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Number of roof thatchers in Britain: **900**

- from *Harper's* Index

Classified Ads Deadline

FermiNews Classified Ads are distributed once a month. Deadline for the March 13 issue is March 3. Forms are available in the Publications Office, WH 3E, MS #107.

FermiNews is published by the Fermilab Technical Publications Office, P.O. Box 500, Batavia, IL, 60510 (312) 840-3278
Editors: R. Fenner, S. Winchester **Photos:** Fermilab Photo Unit
Fermilab is operated by the **Universities Research Association, Inc.**, under contract with the **United States Department of Energy.**

☆ U.S. GOVERNMENT PRINTING OFFICE: 1986—641-072/40015