

FROM: James H. Taylor Manager, Licensing Babcock & Wilcox		DATE OF DOCUMENT July 5, 1977		DATE RECEIVED July 12, 1977		NO	
TO: Denwood F. Ross, Jr. Division of Systems Safety		LTR X		MEMO		REPORT	
		ORIG.		CC X		OTHER	
CLASSIF NP		ACTION NECESSARY ☐		CONCURRENCE ☐		DATE ANSWERED	
		NO ACTION NECESSARY ☐		COMMENT ☐		BY	
POST OFFICE REG. NO.		FILE CODE B&W ATWS					
DESCRIPTION: (Must be Unclassified) Summary of results of B&W simplified ATWS probabilistic study; MTC curves.		REFERRED TO		DATE		RECEIVED BY	
		S. Hanauer					
		H. Ornstein					
		R. Moore (ASG)					
		H. Richings					
		S. Salah					
		A. Thadani					
ENCLOSURES							
REMARKS						Central File-ATWS	
						cj	

U. S. NUCLEAR REGULATORY COMMISSION

MAIL CONTROL FORM

FORM NRC 3265
1-75

8104170270

July 5, 1977

Dr. Denwood F. Ross, Jr.
Assistant Director for Reactor Safety
Division of Systems Safety
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

- References: (1) Letter, D. F. Ross to J. H. Taylor,
May 5, 1977
(2) Letter, J. H. Taylor to D. F. Ross,
May 24, 1977

Dear Dr. Ross:

Within the last month, B&W has performed a simplified ATWS probabilistic study using the data enclosed in Reference (2). A summary of the results is given in the following paragraph and is offered as a comparison to the calculations which we understand the Staff is performing. Additional and more detailed information has been transmitted to Mr. A. Thadani (Reactor Systems Branch) in recent telephone calls.

The B&W evaluation employed a modified Monte Carlo technique, using the SAMPLE computer code, and showed that the most likely peak pressure for a Loss of Feedwater event (assuming no rod motion) is about 2670 psia. The results also show that the analysis conditions imposed by the NRC ATWS Status Report encompass about 0.0008% of the postulated ATWS events. Using the very conservative Staff assumption of scram system unreliability (10^{-6} failures/demand), we conclude that an ATWS event with NRC Status Report conditions is expected with a frequency of about 8×10^{-10} /year.

These conclusions corroborate the B&W position that design changes for ATWS mitigation are of questionable benefit, compared against the safety objective of 10^{-6} - 10^{-7} significant ATWS events per year. If Control Rod Drive Mechanism immunity to common-mode-failure, and the more accurate bounding value of RPS unreliability ($\sim 10^{-6}$ failures/demand) are accepted, design changes for ATWS are even further obviated. We would also point out that the diverse electronic trip system identified in BAW-10099 (May, 1977) can provide assurance that ATWS events

Dr. Derwood F. Ross

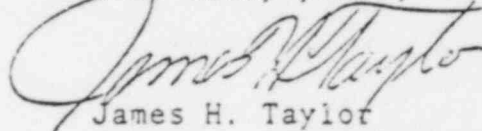
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will occur less often than 10^{-7} per reactor year based on shutdown system reliability alone.

We continue to believe that probabilistic approaches can be used in resolving the ATWS issue, especially since the identification and continued NRC interest in ATWS rests on probabilistic calculations. We submit that the conclusions shown here suggest that major changes to nuclear plants are not justifiable for reason of ATWS. At the least, more information supporting the Staff estimates of scram system unreliability must be acquired before major changes can be shown necessary.

Very truly yours,

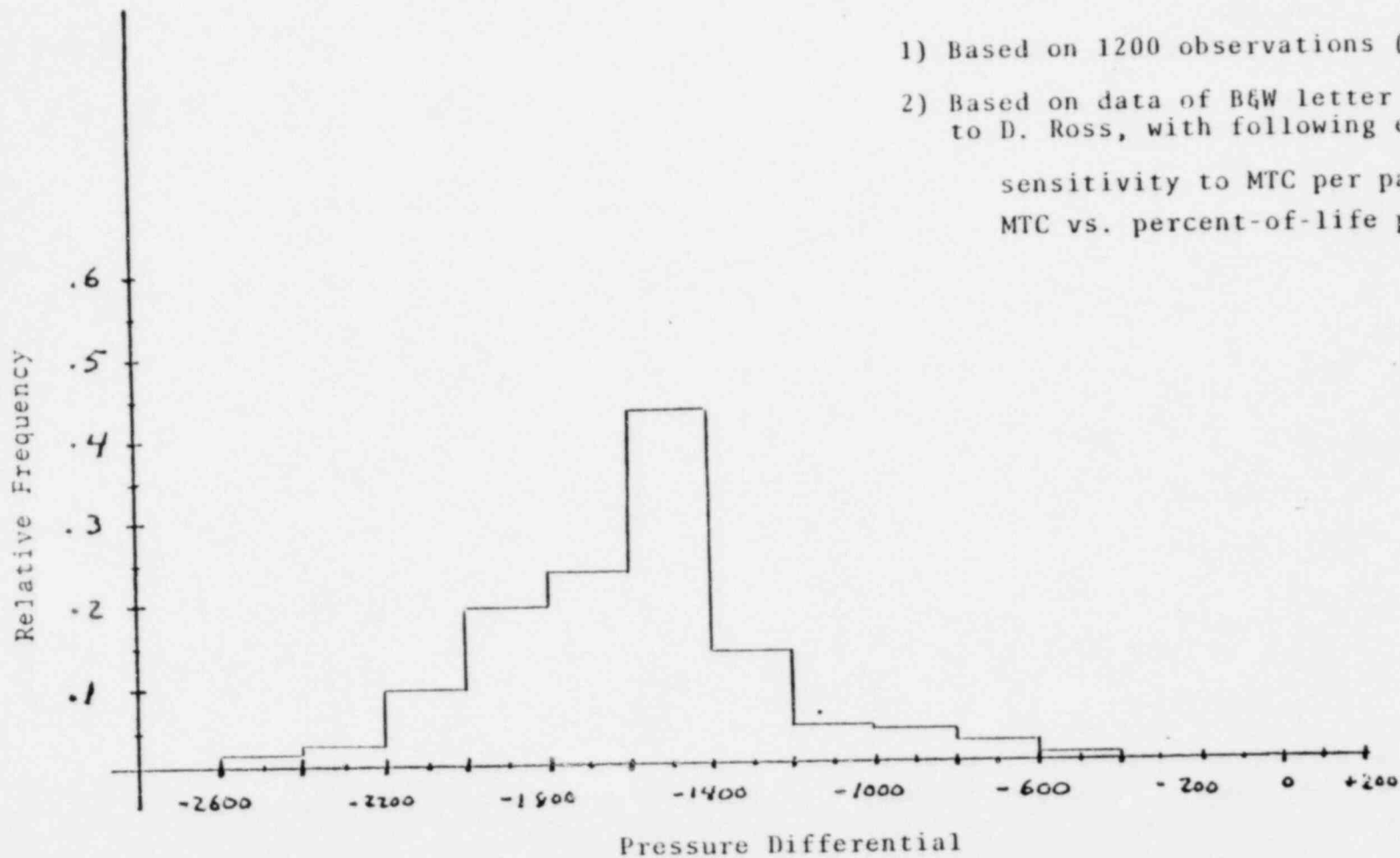


James H. Taylor
Manager, Licensing

JHT:dsf

cc: R. B. Borsum (B&W)
S. H. Hanauer (NRC)

bcc: C. S. Banwarth
B. E. Bingham
J. C. Deddens
S. H. Duerson
J. H. MacMillan
A. F. McBride
D. H. Roy



1) Based on 1200 observations (SAMPLE)

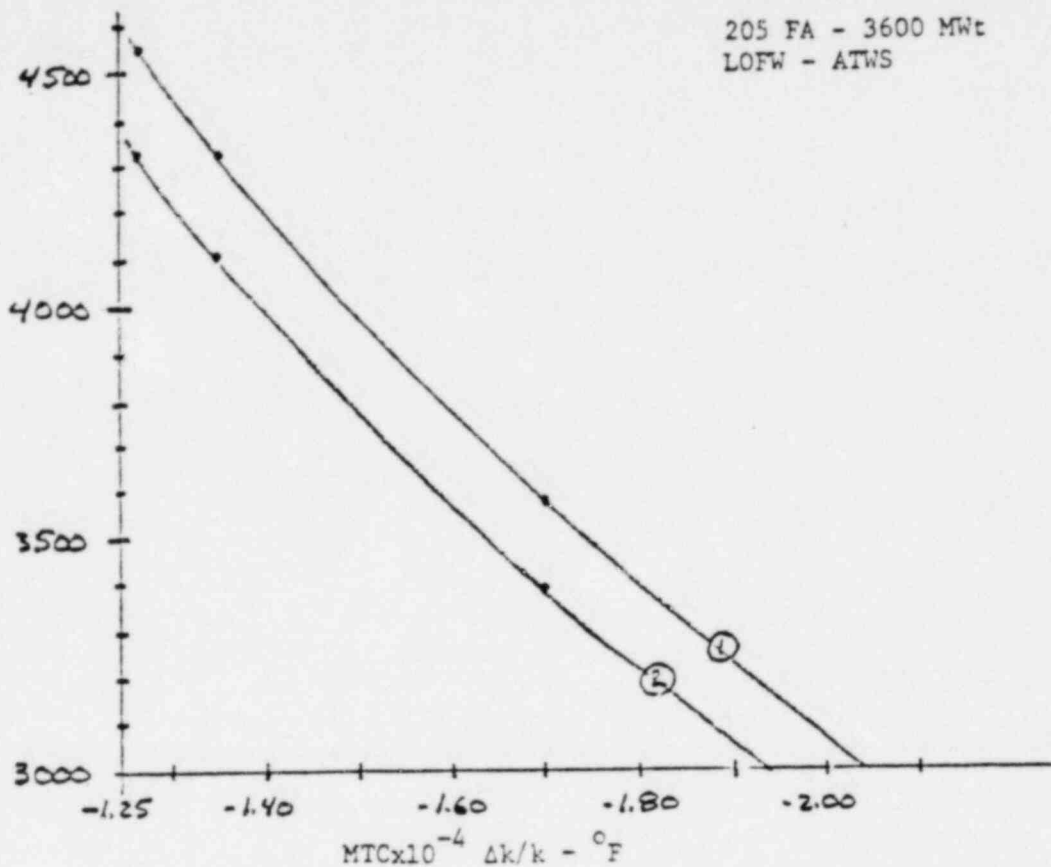
2) Based on data of B&W letter (5-24-77)
to D. Ross, with following exception:

sensitivity to MTC per page 2

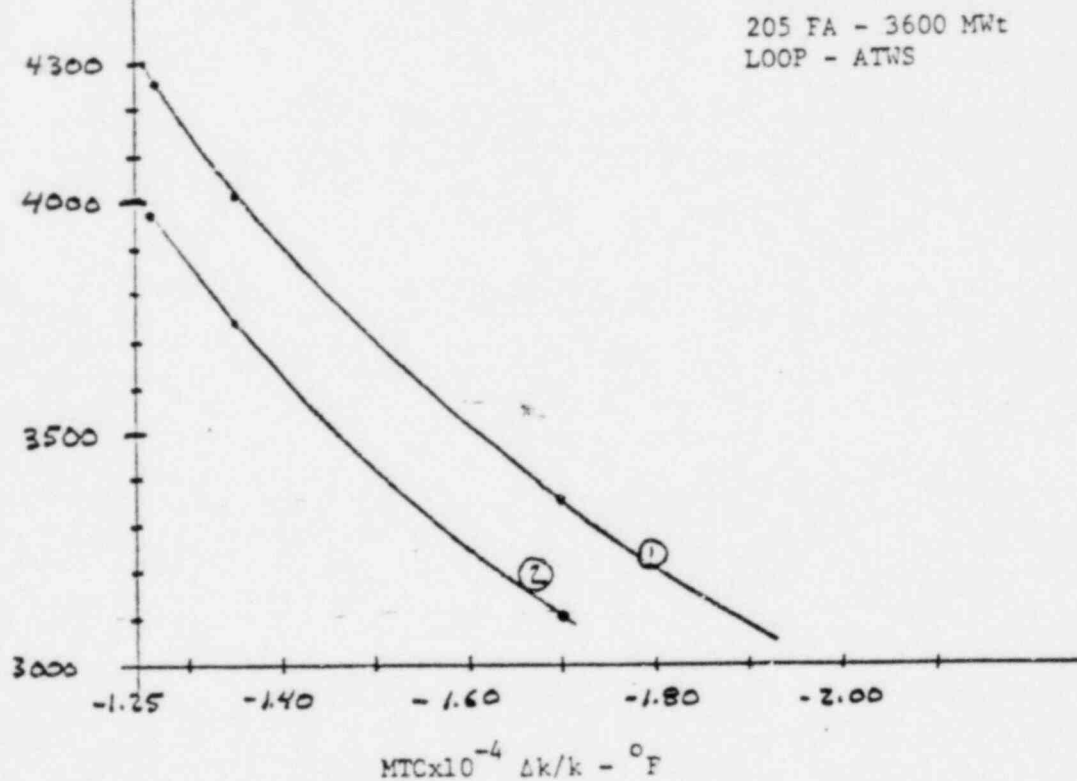
MTC vs. percent-of-life per page 3

Reference to BAW-10099 (May 1977), Appendix A Results for
LOFW and LOOP events (with and without relief valves)

Peak Pressure - PSIA



Peak Pressure - PSIA

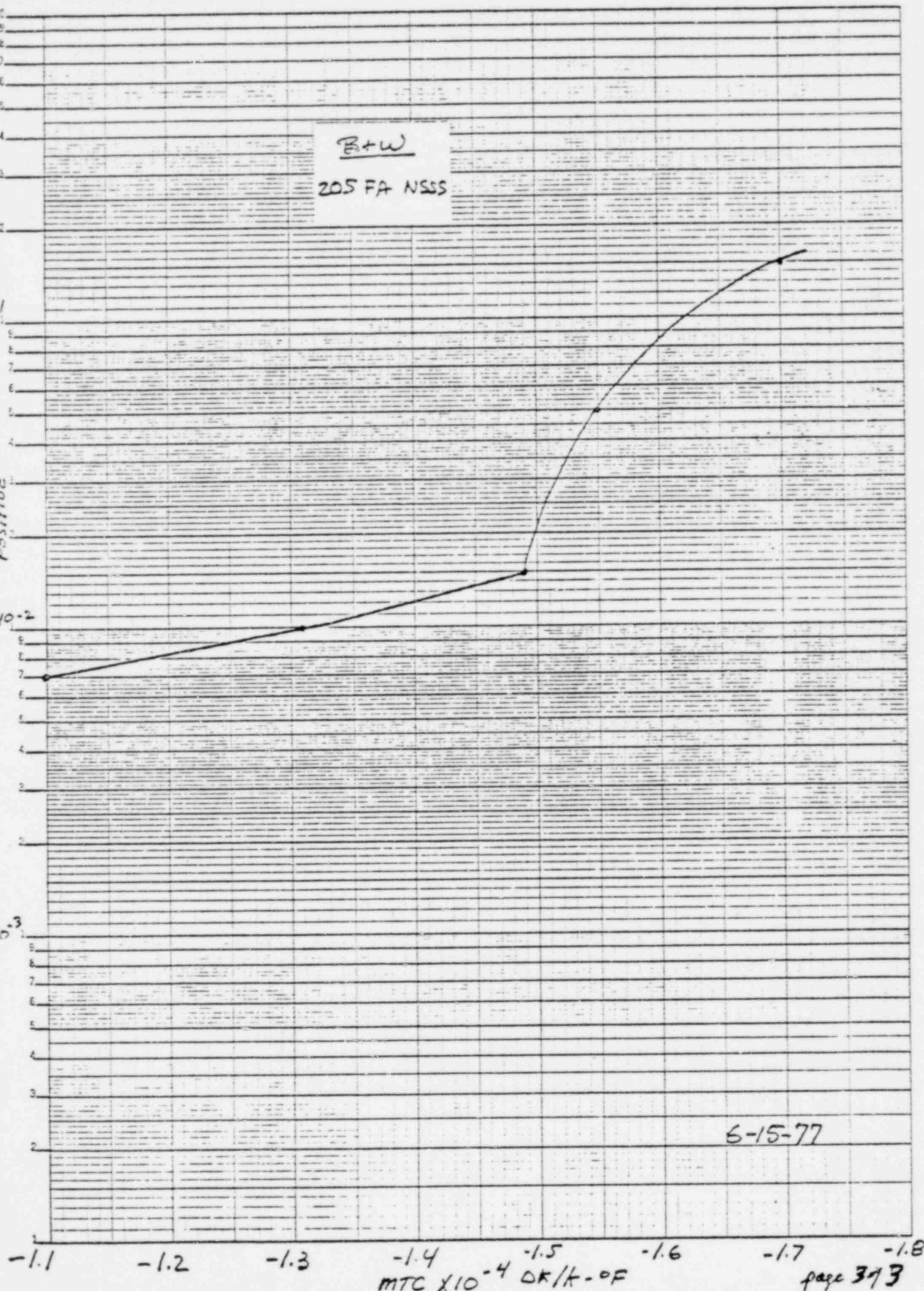


- (1) Consistent with NRC ATWS Status Report guidelines.
- (2) Consistent with NRC ATWS Status Report guidelines, except Pressurizer Pilot-Operated Relief Valve operates on demand.

INJECTION OF LIFE
MTC IS MORE
POSITIVE

B+W
205 FA NSSS

100% SEMI LOGARITHMIC
A CYCLES X TO DIVISIONS
PROFEL & EDDEN CO.
MADE IN U.S.A.

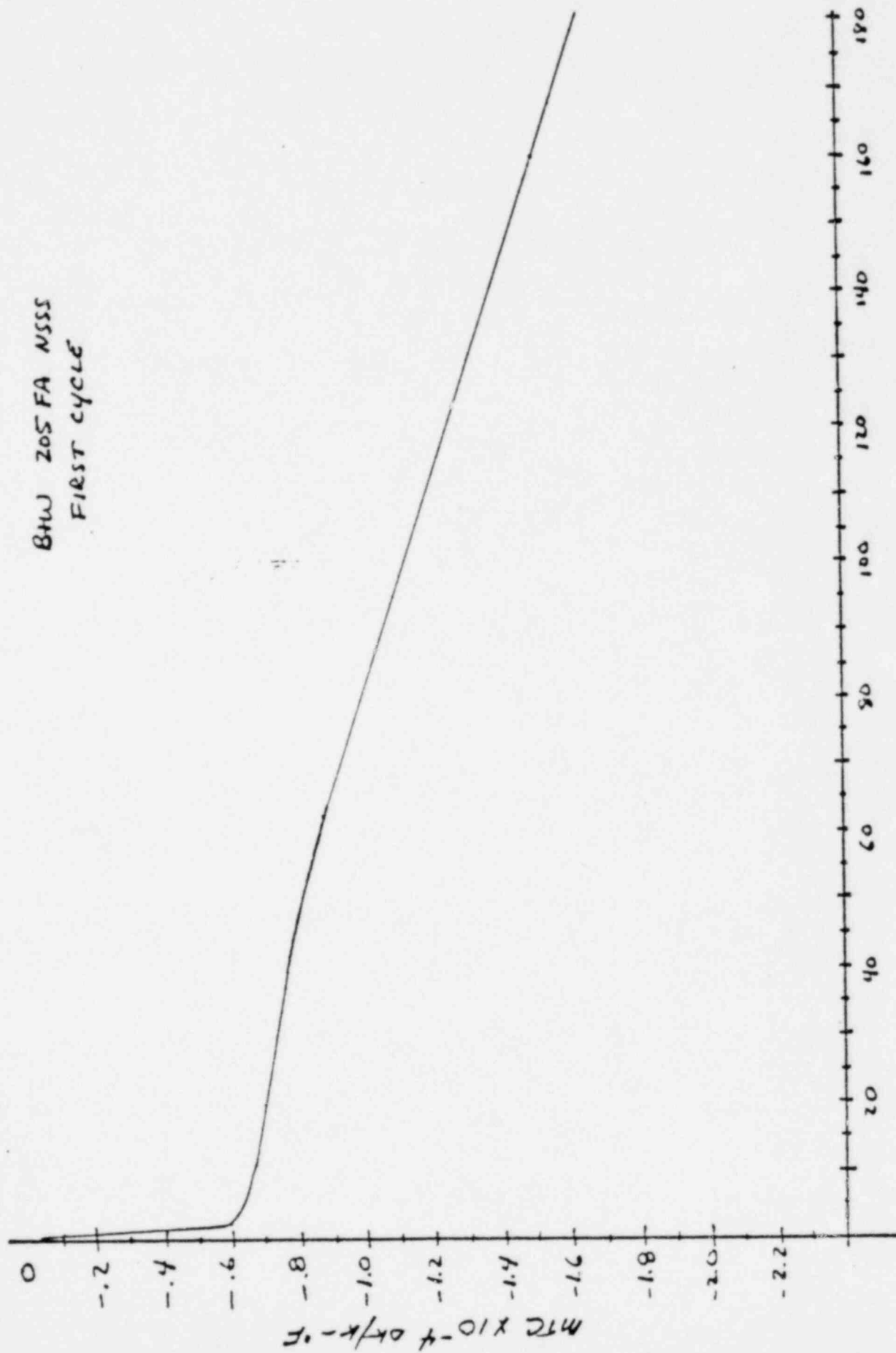


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MTC $\times 10^{-4}$ OR/K-OF

page 313

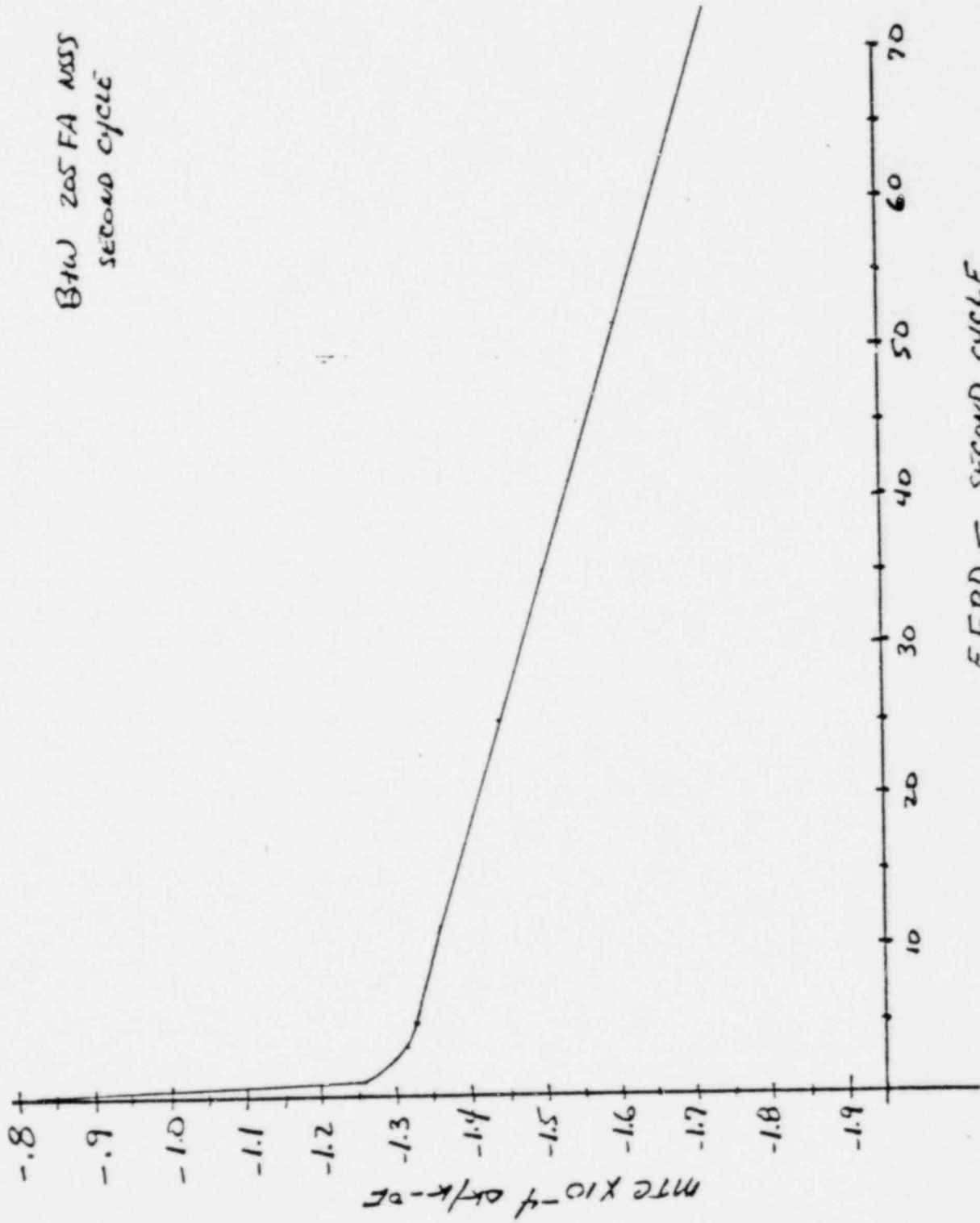
BHW 205 FA NSSS
FIRST CYCLE



EFPD - FIRST CYCLE

6-15-77

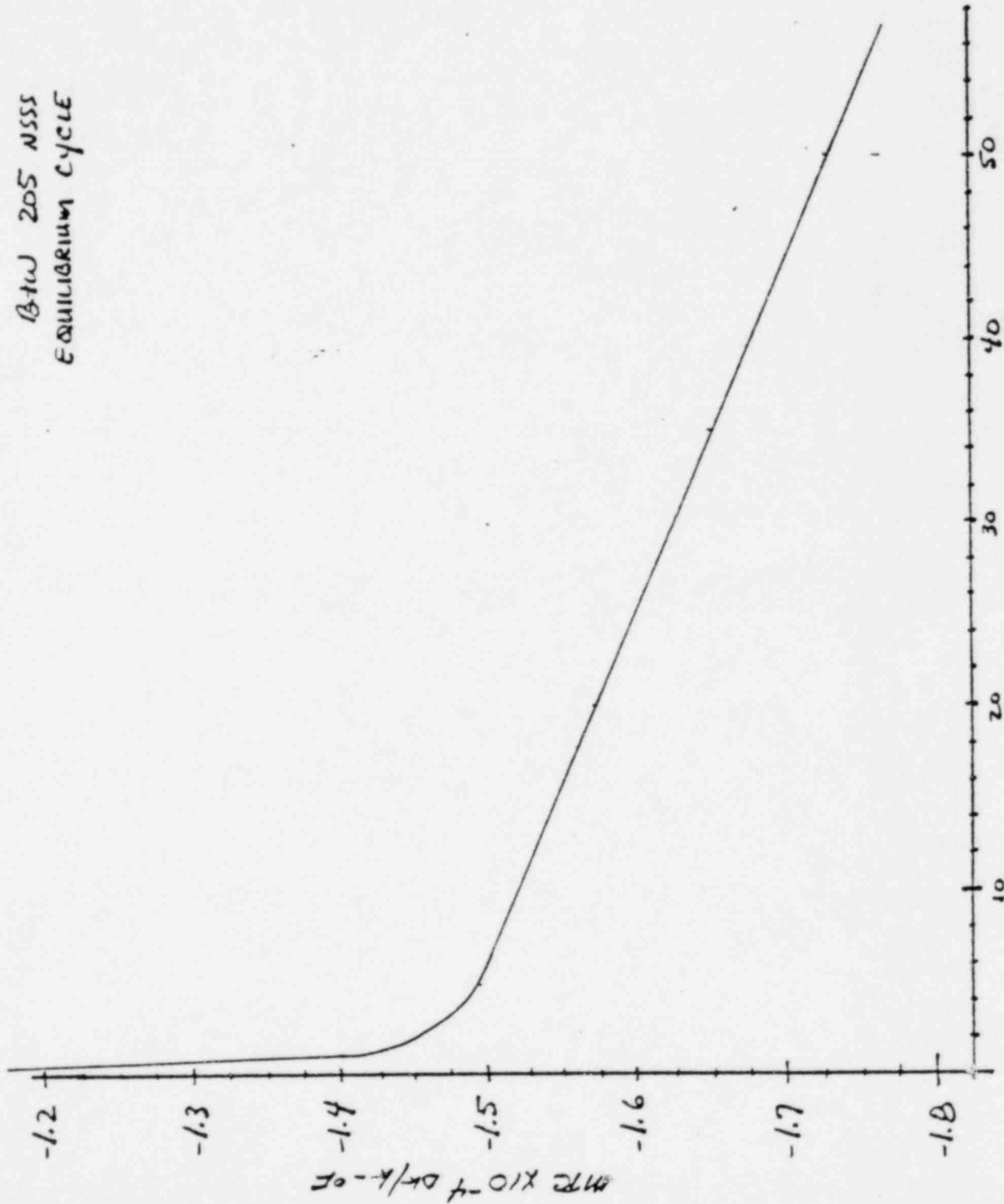
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NOV 7 1977

BtW 205 NSSS
EQUILIBRIUM CYCLE



EFPD - EQUILIBRIUM CYCLE

6-15-77

SAMPLE CALCULATIONS - 205FA (B4W)

Determination of Moderator Temperature Coefficient (MTC) percent-of-life

1. Assumed 40-year (40 cycles) total. EFPD: 11764

2. For ATWS: omit first 20 days of first cycle
omit first 5 days of cycle 2-40

$$\therefore \text{Reference EFPD} = 11764 - 20 - (5 \times 34) = 11549$$

A. Percent-of-life for $MTC \leq -1.30 \times 10^{-4} \text{ dk/K-}^{\circ}\text{F}$

$$\text{EFPD contribution from 1st cycle: } 130 - 20 = 110 \text{ EFPD}$$

$$\text{EFPD contribution from 2-40 cycles: } 0 : 0$$

$$110$$

$$\text{fraction-of-life the } MTC \geq -1.30 \times 10^{-4} \rightarrow \frac{110}{11549} = .00952$$

ie, the MTC is more negative than -1.30 for about 94% of life

B. Percent-of-life for $MTC = -1.55 \times 10^{-4} \text{ dk/K-}^{\circ}\text{F}$

$$\text{EFPD contribution from cycle 1: } 168 - 20 = 148$$

$$\text{EFPD contribution from cycle 2: } 43 - 5 = 38$$

$$\text{EFPD contribution, cycle 2-40: } (16-5) \times 38 = 419$$

$$604$$

$$\text{fraction-of-life the } MTC \geq -1.55 \times 10^{-4} \text{ dk/K-}^{\circ}\text{F} \rightarrow \frac{604}{11549} = .0523$$

ie, MTC more negative than -1.55 for about 95% of life

POWER

TEXT

LT NO. 02000

LT NO.

LT NO.

PROP. NO.

FWG. NO.

GROUP NO.

FILE NO.

COMP. NO.

SHEET NO.

DATE 6-15-77

DATE

4.17

FRACTION OF LIFE
MTC IS MORE
POSITIVE

100%
REMI-LOGARITHMIC
46 6012
4 CYCLES X 70 DIVISIONS
MADE IN U.S.A.
NEUFEL & BROS. CO.

B+W
177FA NSS

$\times 10^{-1}$

$\times 10^{-2}$

$\times 10^{-3}$

-0.7 -0.8 -0.9 -1.0 -1.1 -1.2 -1.3 -1.4
MTC $\times 10^{-4}$ OR $k - OF$

6-15-77

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FRACTION OF LIFE
MTC IS MORE
POSITIVE

100% SEMI-LOGARITHMIC 46 6012
A C-CLES X 70 DIVISIONS
REUFEL & ERBER CO.

B+W
145 FA NSSS

$\times 10^{-1}$

$\times 10^{-2}$

$\times 10^{-3}$

-1.1 -1.2 -1.3 -1.4 -1.5 -1.6 -1.7 -1.8
MTC $\times 10^{-4}$ $\Delta K/K - ^\circ F$

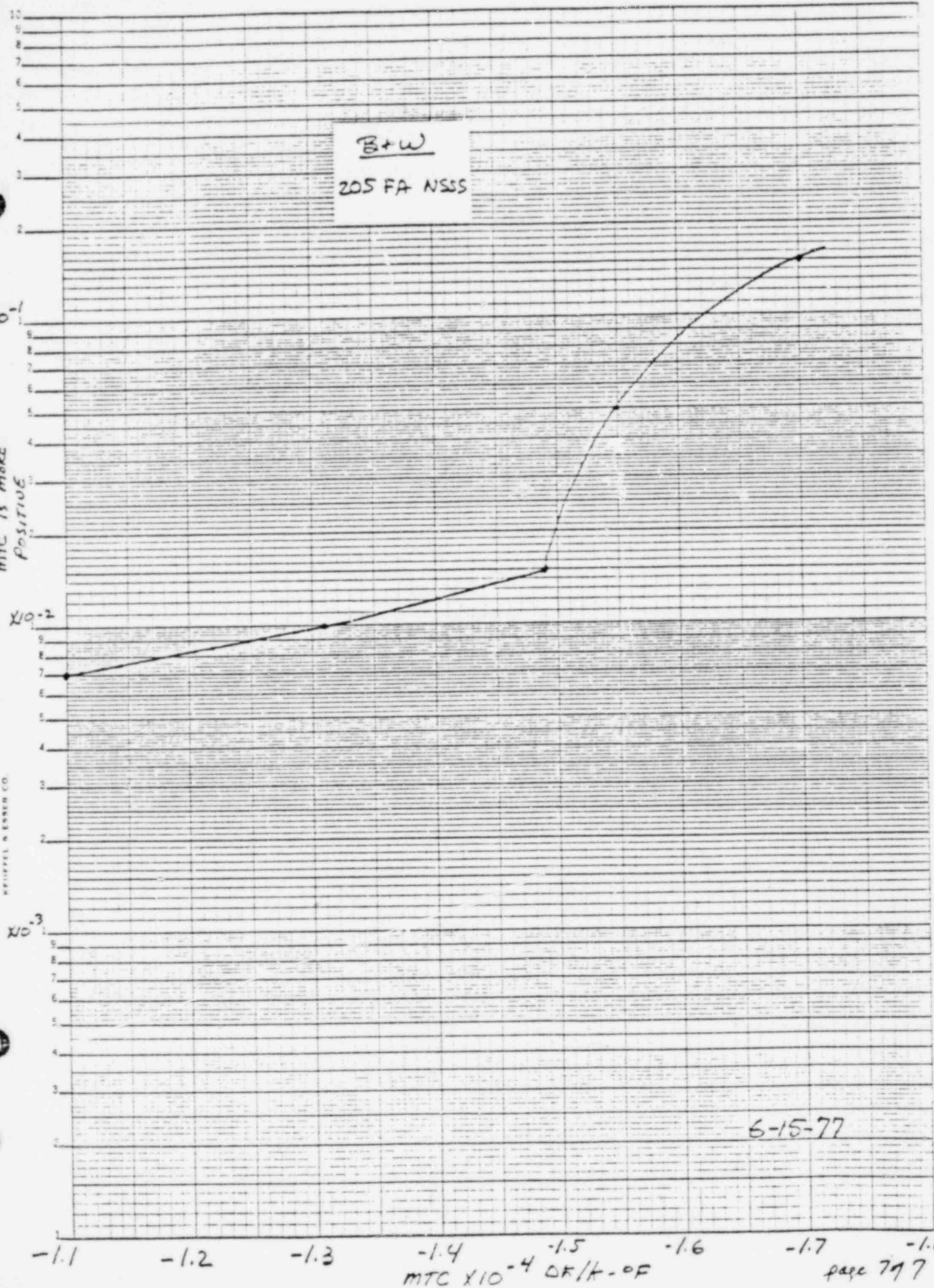
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page 647

TRACTION OF LIFE
MTC IS MORE
POSITIVE

46 6012
SEMI-LOGARITHMIC
4 CYCLES X 70 DIVISIONS
KRIEGER & BENDER CO.
MADE IN U.S.A.

B+W
205 FA NSSS



6-15-77

From: Dennis M. Crutchfield
Authorization To Modify TACS For Category A
Generic Tasks (8xxx Series TACS) Date: June 26, 1978

From: Edson G. Case,
Pecking Order For Use In Manpower / Schedule
Reviews For Category A Task. Date: May 17, 1978

From: Roger J. Mattson.
ATWS TASK ACTION PLAN
Date: TASC November 2, 1977

From: Edson G. Case, (ATWS)
Anticipated Transients Without SCRAM
Date: April 19, 1978

From: Edson G. Case
Procedure For Maintaining Generic Issue Files
Date: March 30, 1978

From: Roger J. Mattson
New Regulatory Activities Management System (RAMS)
Date: April 5, 1978

From: A Thadani
Updating of ACRS Generic Items
Date: April 3, 1978

From: A Thadani
RSB Manpower Commitments to Sep
Date: April 3, 1978

From: Edson G. Case
Tenth Meeting of the Technical Activities
Steering Committee

From: W. Minners
Updating of Status of ACRS Generic Items
Date: March 27, 1978

From: Edson G. Case
Procedures And Responsibilities For Scheduling
Of Generic Technical Activities And Revising
Task Action Plans. Date

From: Edson G. Case (ATWS)
ATWS Plans Date: November 16, 1977

From: Edson G. Case
Summary of Technical Activities Steering
Committee Meeting No. 9, March 17, 1978
Date March 21, 1978

From: Zoltan R. Rosztoczy
ODYN Code Review

From: Roger J. Mattson
Updating of Category A Task Logic Networks
Date: March 10, 1978

From: Karl R. Goller
Requests To licensees For Information

From: Edson G. Case
Comments From The office of Standards
Development on Task Action Plans
Feb 21, 1978

From: Roger J. Mattson
ATWS TASK Action Plan
Date Nov 21, 1977

From: M. B. Aucock
Meeting With Task Managers
Date: Jan 9, 1978

From: Edson G. Case ATWS
Lee V. Gossick, Executive Director for Operations
Date:

From: Edson G. Case
ATWS Plans - Update
Date 2-1-78

From: Edson G. Case
ATWS Plans
Date: Nov 16, 1977

Procedures And Responsibilities for Scheduling
Of Generic Technical Activities And Revising
Task Action Plans

From: Edson G. Case

Inputting Category A tasks into the TACS System
From: Dennis M. Crutchfield
Date: Jan 19, 1978

Generic Issue writeups to Address Alab-444
From: Edson G. Case
Date: JAN 12, 1978

Attached is a draft copy of the justification
for Task Action Plan A-9 (ATWS)

To: R. Mattson From: Ashok C. Thadani Date 12-15-77

DRAFT Status Summary Report For NRR Generic
Technical Activities
From: Roger J. Mattson Date: Dec 19, 1977

May I have your comments, if any, on the format of the
Status Summary Report for NRR Generic Technical
Activities by Thursday, December 15, 1977
To: A. Thadani

From: W. Minner Date: 12-12-77

Attached is a draft copy of the justification
for Task Action Plan A-9 (ATWS).
From: Ashok C. Thadani Date: 12-15-77

Generic Technical Activities
From: Edson G. Case
Date: December 7, 1977

Generic Activities Action Items
From: Edson G. Case
Date: Nov 8, 1977

Comments ON Draft Procedures For Schedule
Changes And Revisions To TASK Action Plans
From: D. F. Ross Date: Nov 15, 1977

Technical Activities Action Items
From: Roger J. Mattson
Date 16, 1977

ATWS Program
From: Malcolm L. Ernst
November 15, 1977

ATWS Plans
From: Edson G. Case

Approved By TASC, August 19, 1977
TASC comment Incorporated, August 30, 1977
To: A. C. Thadani
From: D. F. Ross, Jr. Date 30, 1977

Review of ATWS Report
From: A. C. Thadani
Date: Oct 31, 1977

ATWS - Category A Item (Task A-9)

From: A. C. Thadani

Date: Oct 25, 1977

Seventh Meeting of the Technical Activities
Steering Committee

From: Edson G. Case

Date: Oct 28, 1977

May I have your comments by the date indicated on
the attached.

To: A. C. Thadani

From: W. Minners

Date: 11-10-77

Procedures For Schedule Changes And
Revisions To Task Action Plans

From: Michael B. Aycock

Date: Nov 9, 1977

Procedures And Responsibilities For Scheduling of
Generic Technical Activities And Revising Task Action
Plans

From: Edson G. Case

Date: 11-4-77

Review of ATWS Report

From: A. C. Thadani

Date: October 19, 1977

Review of ATWS Report
From: Roger J. Mattson Date: October 19, 1977

Approved Category A task Action Plans
From: Edson G. Case Date: Sep 16, 1977

Approval of Task Action Plans for
Category A Technical Activities
From: Edson G. Case, Date: Aug 23, 1977

Category A Action Plans
From: Denwood F. Ross, Jr. Date: July 14, 1977

Category A Action Plans
From: D.F. Ross Jr. Date: July 21, 1977

ATWS Milestones
From Denwood F. Ross, Jr. Date: Jun

Technical Activity Action Plans
From: R.E. Heineman Date: June 8, 1977

Development of Task Action Plans for Date: 5-25-77
Category A Technical Activities From: Edson G. Case

Task Action Plans For Category A Technical Activities

From: Robert E. Heineman Date: Jun 15, 1977

Task Action Plans For Category A Technical Activities

From: Frank Schroeder Date: July 7, 1977

ATWS Evaluation

From: D. F. Ross Date JAN 29 1976

ATWS Manpower Requirements

To: Thomas M. Novak

From: Ashok C. Thadani Date Nov 5, 1976

ATWS MILESTONES

To: D. F. Ross

From: R. J. Bosnak Date JUN 28, 1977

CSB Schedule For Completion of ATWS Milestones

To: D. Ross

From: R. Tedesco Date: July 5, 1977

Technical Activity Program A-9 - ATWS

To: A. C. Thadani

From: T. A. Ippolito Date July 19, 1977

ATWS Milestones

To: A. Thadani

From: D. Bunch Date: July 5, 1977

Category A Action Plans

To: Roger J. Mattson

From: Victor Stello, Jr. Date: July 28, 1977

Sixth meeting of the Technical Activities Steering Committee

From: Edson G. Case Date Oct 11, 1977

Review of ATWS DRAFT Report

To: D. F. Ross, Jr.

From: Thomas M. Novak

Proposed Division of Systems Safety Categorization of work Assignments

From: R. L. Tedesco Date: Oct 21, 1977