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Technology Insertion (TI)/Industrial Process Improvement (IPI) Data Base Documentation Book Volume, for SA-ALC/MANTPFA (Unified Fuel Control (UFC's) Book 1 of 2. This document contains detailed information about layouts equipment and processes for this RCC (Resource Control Center). It

Also includes Simulation Modeling info for this RCC. See also Book 2, ADA 239 299.

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1.0

OVERVIEW

ENGINEERING NOTES

EMPLOYEE RANDY HARRISDATE 6/15/90 - 6/22/90PAGE NO. 1 OF 2RCC MATPFASUBJECT UFC FLOW DIAGRAM, MISC INFOPRELIMINARY OBSERVATIONS AND COMMENTS ON THE UFC
PROCESS FLOW AND WIP PROCEDURES

THERE ARE TWO REASONS FOR A UFC TO BE SENT TO BUDG STS -
(1) A FAULT DETECTED IN THE FIELD (APPROXIMATELY 92% OF THE TIME),
OR (2) A SCHEDULED "CHECK-UP" FOR THE UFC AFTER A DETERMINED
NUMBER OF HOURS IN OPERATION. IF THE UFC MEETS SPECIAL INVESTIGATION
TEAM^(SIT) CRITERIA, THE^{MR} TEAM WILL PROVIDE THE APPROPRIATE REPAIR INSTRUCTIONS.
OTHERWISE, THE ON-CONDITION MAINTENANCE (OCM) TEAM WILL DETERMINE WHAT
IS REQUIRED IN TERMS OF REPAIR OPERATIONS FOR THAT PARTICULAR UFC.

THE UFC CONSISTS OF THREE SECTIONS - THE DISTRIBUTION BODY
(DB), THE GAS GENERATOR (GG), AND THE AUGMENTOR COMPUTER (AC). THE
DISTRIBUTION BODY HAS 29 DIFFERENT TASKS ASSOCIATED WITH IT WHICH
COULD BE PERFORMED IN THE REPAIR PROCESS, THE GAS GENERATOR HAS
56 DIFFERENT TASKS ASSOCIATED WITH IT, AND THE AUGMENTOR COMPUTER
HAS 32 TASKS ASSOCIATED WITH IT. ALTHOUGH THE CURRENT TRACKER
DATA IS SOMEWHAT QUESTIONABLE IN ITS CURRENT PROTOTYPE STAGE,
CERTAIN ELEMENTS OF THE DATA CAN BE USEFUL FOR INITIAL DEVELOPMENT
OF THE UDDS MODEL. ONCE AN INITIAL RUN OF THE MODEL IS COMPLETED,
THE OUTPUT CAN BE STUDIED TO DETERMINE IF CERTAIN CRITERIA HAS BEEN
SATISFIED. WHEN TRACKER INFORMATION BECOMES REASONABLY CONSISTENT AND
RELIABLE, THE DATA CAN BE INPUTTED TO THE MODEL WHICH SHOULD
GENERATE A MORE ACCURATE REPRESENTATION OF SHIP FLAME CONDITIONS.

DUE TO THE VARIABLE NATURE OF THE UFC REPAIR PROCESS,
THERE IS ONLY A GENERAL FLOW DIAGRAM OF A "TYPICAL" UFC
MOVING THROUGH THE OCM PROCESS. EACH UFC CAN LITERALLY HAVE
ITS OWN CRITICAL PATH DEPENDING ON WHAT REPAIR/SCHEDULED MAINTENANCE
IS REQUIRED. IF DEMATING OF THE SECTIONS IS REQUIRED, SIGNIFICANT
WAITING DELAYS CAN OCCUR IF MUCH WORK IS REQUIRED ON THE
GAS GENERATOR, AUGMENTOR COMPUTER, OR DISTRIBUTION BODY SECTION.
ANOTHER SOURCE OF DELAY CAN BE TEST STAND AVAILABILITY. THE
5002 TEST STANDS ARE USED FOR SEVERAL TASKS AND CAN CAUSE A

DDB SECTION CODE #1, #3, #4

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010001

ENGINEERING NOTES

EMPLOYEE RANDY HARRISDATE 6/18/70-6/22/70PAGE NO. 2 OF 2RCC MATPFA

SUBJECT _____

PAID TO WAIT IN QUEUE AT THE BEGINNING OF THE PROCESS FLOW IF NEARLY COMPLETED UFCs ARE BEING TESTED BEFORE FINAL SHELLOFF, AN EXAMINATION OF SCHEDULING PROCEDURES OR CONSIDERATIONS OF ALTERNATIVE ROUTING COULD PROVIDE SOLUTIONS TO THE INITIAL PROCESS FLOW DELAYS.

THE GAS GENERATOR STATUS IS CRITICAL IN TERMS OF DELAY TIME THE ASI TEST. THE ASI TEST WILL NOT BE REPERFORMED UNTIL THE WORK REQUIRED ON THE GAS GENERATOR HAS BEEN COMPLETED. TWO REASONS EXIST FOR CONDITION: (1) - THE SETUP ON THE TEST STAND (5002) IS GREATLY FACILITATED IF THE AC-DB SECTION AND THE 66 SECTION CAN BE INSTALLED SIMULTANEOUSLY ON THE STAND, AND (2) THE AVAILABILITY OF TEST STAND OPERATORS CAUSES A POTENTIAL TIME DELAY. THE UTILIZATION PERCENTAGES COMPUTED FROM THE USAGE REPORTED SHOULD PROVIDE INDICATIONS AS TO WHETHER ALTERNATIVE ROUTING PROCEDURES MIGHT BE FEASIBLE TO IMPROVE THROUGHPUT AND DECREASE THE CURRENT WIP LEVELS. THE 5002 AND 5005 USAGE AND QUEUEING LEVELS SHOULD INDICATE POTENTIAL AREAS OF CHANGE.

FURTHER EXAMINATION OF OPERATION DESCRIPTIONS AND METHODS, ESTIMATED OPERATION TIMES, NUMBERS OF CYCLES ON "AVERAGE" UFC MAY GO THROUGH IN PARTICULAR SECTIONS OF THE PROCESS FLOW, AND PLANNING AND SCHEDULING FUNCTIONS WILL BE PERFORMED OVER THE NEXT FEW WEEKS. FURTHER COMPILED SHOP FLOOR DATA AND PROPER MANIPULATION OF THE TRACKER DATA BASE SHOULD FACILITATE THE DATA COLLECTION PROCESS AND FORMULATION OF THE UDQS FRAT FILES.

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DDB PAGE NO. _____

019002

ENGINEERING NOTES

EMPLOYEE RANDY HARRISDATE 6/25/90 - 6/29/90PAGE NO. 1RCC MATPFASUBJECT UFC PROCESS FLOWUFC PROCESSES

A THOROUGH ANALYSIS WAS PERFORMED IN THE AREA C, B, AND D SECTIONS OF THE UFC OVERHAUL AREA. DISCUSSION AND CONFIRMATION OF THE GENERAL UFC PROCESS FLOW DIAGRAM AND ASSOCIATED OPERATION TIMES AND OCCURRENCE FACTORS WAS OBTAINED FOR MOST STEPS INDICATED. SHOP FLOOR ESTIMATES TENDED TO SUPPORT THE OCTOBER-NOVEMBER DATA OBTAINED FOR THE PROCESS, IMPROVEMENTS WHICH HAVE BEEN IMPLEMENTED IN THE FLOW (ESPECIALLY TEST STAND OPERATIONS) WERE EXPRESSED BY SHOP PERSONNEL AND CHANGES TO THE RELEVANT OPERATIONS WERE INPUTTED, BEFORE THE ACTUAL FLAT FILES ARE SUBMITTED FOR AN INITIAL MODEL RUN, SEVERAL KEY UFC PERSONNEL WILL BE QUERIED FOR A TENTATIVE VALIDITY OF THE DATA.

THE PROBABILITIES FOR DECISION NODES IN THE PROCESS FLOW AND THEIR ACCURACY WILL BE CRITICAL FOR MODEL SUCCESS. THE PRIMARY SOURCES FOR THIS INFORMATION WILL BE - (1) OCM TEAM DATA, WHICH IS CURRENTLY BEING GENERATED TO OBTAIN PRECISE PROBABILITIES; (2) THE OCTOBER-NOVEMBER DATA WHICH IS STILL CONSIDERED VALID; AND (3) SHOP FLOOR ESTIMATES AND DATA EXTRACTED FROM TRACKER.

WITH REGARD TO CYCLE OCCURRENCES, THE OCM TEAM WILL BE ACCUMULATING DATA TO ESTABLISH ACCURATE FIGURES. THE INFORMATION WHICH THE OCM TEAM WILL BE COLLECTING CONCERNS REQUIRED DEMATES, REQUIRED GG REPAIRS, AC/DB REPAIRS, REQUIRED DOUBLE-ORAMING, NUMBER OF DEMATE CYCLES, AND THE NUMBER OF DOUBLE-DEMATE CYCLES.

THE DATA COLLECTION PROCESS IS PROCEEDING WITH EQUIPMENT AND MANPOWER DATA BEING COLLECTED ALONG WITH FIS AND FH ITEM PROFILE INFORMATION. THE OPERATION PROFILE INFORMATION IS BEING ASSIMILATED THRU VARIOUS RESOURCES WITH THE INTENT OF DEVELOPING A WORKING MODEL TO REPRESENT A SPECIFIED PERIOD OF PRODUCTION. ALTHOUGH THE MODEL WILL INITIALLY NOT CONTAIN "PINPOINT ACCURATE" DATA, THE RESULTS SHOULD AT LEAST BE REASONABLY ACCURATE. ESTABLISHING A FOUNDATIONAL BASIS FOR FURTHER DEVELOPMENT.

AS DISCUSSED IN PREVIOUS NOTES, IT STILL APPEARS AS THOUGH THE WORK-IN-PROCESS AND THE TEST STAND OPERATIONS WILL BE THE MAIN POTENTIAL SOURCES OF PROCESS SAVINGS.

DDB SECTION CODE #1DDB PAGE NO. 010003

ENGINEERING NOTES

EMPLOYEE Phillip Parker DATE 6/18/90 PAGE NO. 1
RCC MATPFA SUBJECT Project start-up

Project start-up was officially 6/18/90 for SA-ALL Industrial Processes Program. Since this first week will mainly entail setting up the office and in-processing people, I will simply notate significant events or discussions by date in the next few pages. When actual RCC evaluation occurs I will begin more thorough record keeping.

6/18/90 -

At 1:00 p.m. this afternoon we had our initial in-briefing with the ALL MA and support personnel. This meeting was co-chaired by Pete Garza, the ALL contact point, and Greg Gardner, the MAMSC site leader. The meeting was of a general nature, serving as a "get acquainted" meeting, and reviewing the program's objectives and strategies. There were few questions generated from this meeting. Col. Gagnon^(SR) expressed some concern on the use of general I.E. skills to perform such widely different task orders. Greg pointed out that several specialists were scheduled to be brought in throughout the project, which should certainly increase the viability of our suggestions. He also expressed concern that his people be trained in the IPI methodology, so that they could carry on with the process after these task orders end. The meeting ended without further discussion or any action items identified.

One point of order: I feel that thanks are due to Susan Schattle, who has been instrumental in helping us set up our office, as well as assisting us as an interface between ALL personnel and the various support functions we must deal with. I believe Susan will also be an excellent source of information about SA-ALL divisions and broad categories of ALL information. This should prove of great

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010004

ENGINEERING NOTES

EMPLOYEE P ParkerDATE 6/19/90PAGE NO. 2RCC MATPFASUBJECT Project start-up

benefit. I also feel that she would be the most natural point of contact for training ALL personnel in IPI methodology or specific task (such as preprocessor, data formats, data collection technique, etc.).

6/19/90 -

We met with Earl Carter this A.M. on the Tracker system, which is used to collect process data at the floor level. This system is a prototype at this time, and is only being used on first shift. After the "bugs" are worked out, the system will be introduced the the other two shifts. The discussion with Earl was very general, and mostly was of an introductory nature. The most significant action item from this meeting was to alert Earl that Scott Uroman would like to meet with him on Friday, 6/22/90. Earl agreed to prepare certain printouts for Scott to review on Friday.

6/20/90 -

We toured the shop with Merylynn Henderson, the UFC production engineer. I was impressed with the changes in this RCC since my last visit in January. They have corrected many of the problems which were apparent at that time, and have increased their production rates significantly. I am afraid that many of their remaining problems are going to be more difficult to overcome, as many of these appear to be linked to administrative procedures and practices which have been long entrenched in the AFLC and this RCC in particular. Many of those practices are probably responses to conditions which existed in previous years, but are no longer valid. Luckily, this RCC appears to be blessed with

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010005

ENGINEERING NOTES

EMPLOYEE P. ParkerDATE 6/20/80PAGE NO. 3RCC MATPFASUBJECT Project start-up

a progressive administrative and management structure, as well as Ms. Henderson, who strikes me as extremely competent and informed,

One significant problem which Ms. Henderson feels this shop has is over induction of end items, or high WIP. This problem is further complicated by the fact that there is not necessarily a set path which any one UFC will follow through the repair process, and the UFC or its subcomponents could be scattered throughout the shop. Since there are many non-designated waiting or storage points which these items could be found, it becomes a logistical problem in determining where to find a particular UFC or its subcomponents. This will naturally make it more difficult to implement the Tracker system. These areas of concern will be reviewed by the IPI team more closely at a future date.

I must say that this RCC is doing things which I must highly praise. Many of the procedures and management techniques they are experimenting with appear to be unique to this shop and SA-ALL itself. While there are bound to be setbacks with any such progressive system, I believe it is this spirit of wanting to change ineffective practices of the past which is the only true means of producing efficient, lasting process improvements. The administration of this RCC is to be commended, in my opinion, for being willing to take what must be a high risk approach. (High risk here denoting the willingness to make mistakes, and thereby learn from them, in an environment not well known to tolerate mistakes of any kind. As we all know, administrators who do not tolerate mistakes of any kind can easily paralyze their engineering and production personnel, who are too afraid of trying anything new).

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010006

ENGINEERING NOTES

EMPLOYEE P. ParkerDATE 6/21/90PAGE NO. 4RCC MATPFASUBJECT Project start-up

6/21/90 -

Most of today has been spent gathering general information about UFC processes from Mr. Henderson, as well as setting up our office and computer equipment. I am compiling my rough notes into a legible whole, so that they can be included in Monday's notes, 6/25/90. While I do not like doing my engineering notes this way, this first week has been so hectic that I have had little choice.

6/22/90 -

We had a meeting with Mr. Sosa, who is the production manager for this area. He introduced the IPI personnel to his first and second level supervisors, and we gave a short briefing on the nature and objectives of this program. There were few questions, and we adjourned the meeting. Mr. Henderson agreed to provide us with an organizational chart for this area as soon as possible.

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ENGINEERING NOTES

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EMPLOYEE BA McFARLANEDATE 17 July 1974PAGE NO. 30 of 1 //

RCC _____

SUBJECT _____

1 pm - Mtg w/ USAF & GS folks

Pete Garza briefed us to our roles & objectives

- Req. support from everyone - maint. on up through sys

Greg Gardner gave MDC pitch / explain how we'll get to end result

Only a few questions put to us - feel that there are probably more, but due to heat (no A/C) everyone was in a rush?

Too bad - we need all concerns on the table right now.
Hidden agendas will not help the program

making plans to do tours and conduct interviews

need to tap into outside network for access into civilian companies during the next weeks

call Daytona for trip sheet on contacts for:

Continental

NWA

United

Delta

US Air

make contact w/ department heads for

Planning, Scheduling, Production, QA,
Training, Inventory Control, Training

ENGINEERING NOTES

EMPLOYEE LKB

DATE 1/71

PAGE NO. 1/2

RCC _____

SUBJECT _____

Planning - according to M4

Terry Chican - UFC -

- does T.O. verification / Test Stand
- works w/ software people
- on approval committee
- a real asset to program

↓ have way
too many
test stands

Charles Bradley / Joe Zamora

- work directly for Bob Wojtek
- generic planners
- keeps track of special tools
- keeps bills of materials accurate
- in chrg of labor standards & wk control docum.
- employee suggestion experts
 - ie. suggestions go direct to office w/ no technical expertise, then routed to special areas for validation & comment
- c.B. meets w/ Bendix people on problems w/ supplies & parts
- deal w/ T.O. waivers (Form 103)
- handles special routing of parts
 - ie. parts awaiting info on projects or parts contributing to data collection for acct accident or incident

OCM team consists of: Planning, QA & Production

173 test stands are "automatable" but manual

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010009

ENGINEERING NOTES

EMPLOYEE _____

DATE 1/71PAGE NO. 2/2

RCC _____

SUBJECT _____

M.M.F. - in charge of rewriting T.O.s
- have 1 engineer to validate processes

Scheduling according to MH

in general, S. keeps track of in/out work
and of AWP (missing parts & tracking
serial #s)
also responsible for MLC (Parts Store/inventory)
↳ Material Inventory Control

Manages FORKLIFTS & TRUCK DRIVERS

TRACKS BACK ORDERS, INDUCTIONS & SALES

(Sales are completed jobs)

CEMS - Comprehensive Engine Monitoring System

Section Chief (GS12 slot) is vacant

Mary Banda - currently running scheduling,
supervises about 12 people directly

Henry - in/out logging

scheduling

Manual log books / card files and are not cross-referenced
using computer print-outs from somewhere - format is
for DS and won't give S. what they need

spend alot of time at mtgs (preparation for, being at and
debriefing)

UFC
Control #s
and
TCTOS.

ENGINEERING NOTES

EMPLOYEE LKBDATE 172PAGE NO. 1/3

RCC _____

SUBJECT _____

Interview w/ MARY BANDA - Scheduling

attends meetings - quarterly pre-negotiating
of work orders

The quarterly schedule gets broken down into
each month - divide assets by 3

Temporary (unscheduled) job orders make up 20%
(approx) of the work load.

UFC line - head scheduler w/ 2 assistants

Renegotiation and drive adjustment record - worked when parts
don't come in ~~and~~ jobs are delayed.

RUSH ORDERS - MICAP (Mission Impact — — —)

Engine department - sends work orders on quarterly
basis (but by month)

MISTR workload - work drive has fairly accurate
estimates for most quarters (comes from
PS/SD)

They let MM know about parts constraints every 2 wks

They do have problems w/ T56 work stands - they're
old, can't get repair parts - but awaiting
2 new test stands in October.

The NOZZLE WORKLOAD IS A PROBLEM AREA - goes abit slow

ENGINEERING NOTES

EMPLOYEE LKBDATE 172PAGE NO. 2/3

RCC _____

SUBJECT _____

The procedures which govern scheduling usually work well. If not, suggestions can be sent in for rewrite to DS.
— Doesn't recall last time this has happened.

Computer - used primarily for
Material Support
Scheduling Support
Workloading

demonstrated a couple of items one can call up on computer. Most of the schedulers use their manual system because they are more comfortable w/ it.

Data is input every day — there are several print-outs that can be pulled up regularly.

"Stock number Deep Look" appeared to be a really good pull-up report, but I'm not sure it's used to its full advantage.

There's also a pc that has not been used yet because they're waiting for "someone" in the sys to come train them.

It's hard to tell how much this office actually knows about the whole computer program. Several applications could not be accessed, but no one knew why, who used that particular application, etc.

ENGINEERING NOTES

EMPLOYEE LKBDATE 172PAGE NO. 3/3

ROC _____

SUBJECT _____

Went back to Inventory Section (MIC) to talk w/ these folks

They're using computer extensively, but they have back-up computer print-outs for emergencies (computer down)

Key in parts used from mechanic's Request form - ~~Groups of~~ Each person in the key punch area is assigned to a certain group of data to input. Some seemed busy; some seemed bored.

- Pending items are filed in their desks -

As far as inventory goes, even "open bin" items are controlled also

They ~~are~~ have started using "profiled" mechanics to pre-package high-usage items into kits, as opposed to pulling items separately, as a time saver.

Occasionally have problems getting ~~the~~ parts due to warehouse freezes

* "Recommended" stock requirements not always met

They appear to be getting the job done, however, and they are creative and flexible.

ENGINEERING NOTES

EMPLOYEE LKBDATE 173PAGE NO. 1/1

RCC _____

SUBJECT _____

9:30 A - Production Dept Mtg

Meet all supervisors for day shift, plus Mr. Adam Sosa, Production Chief.

Look fwd to mtg w/ Frank Mann - need to talk about training requirements and his overview of the OCM team in general

Also want to talk w/ Mark Carroll, who is in charge of distribution, ~~modification~~ overhaul of test equipment.

- have heard several conflicting stories about test stands, as to whether or not they work properly - how often they're down, etc. -

working w/ team on incoming data - very little info to make comparisons with yet.

Set up appointment w/ Planning and also Frank Mann for Monday, if possible.

Am starting to make phone calls to set up appointments w/ various airlines. Data collection will start Tuesday or Wednesday at Houston w/ Continental.

ENGINEERING NOTES

EMPLOYEE LKBDATE 175

PAGE NO. _____

RCC _____

SUBJECT _____

made contact w/ several Houston people and it's set up for Tuesday or Wednesday w/ a call back after I find out which day I can fly on Monday.

I'll visit the planning and maint control sections in the AM and go out to the maint hangars in the PM.

- get w/ Greg to confirm after date is set.

- try to get into on:

- training programs
- scheduling programs
- computer assets
- maint costs or estimates
- aging acct problems
- eng overhaul info
- tracking systems

ENGINEERING NOTES

EMPLOYEE LKBDATE 176PAGE NO. 1/2

RCC _____

SUBJECT _____

TRAVEL agency to set up trip ✓

CALL CONTACTS TO CONFIRM ✓

CONFIRM w/ Greg ✓

Noreen and Ron arriving - talk w/ Noreen
about computer input (how to on Apple)

(look into getting an IBM laptop w/ Word Perfect
for ease of compiling notes)

Strategy meeting - plans for rest of week

I depart on Friday for 3 weeks back to
Germany. List follow up items needed
to be accomplished while off site.

Frank Mann came in to tell me he was tied up
in meetings all day and was going out of
town on Tuesday till Wednesday.

Give me contact for temporary data collection
and we'll have to talk upon my return in
end of July. See Marco Lopez, also ext. 4491

EMPLOYEE Baumgardner
RCC _____DATE 25 June 90
SUBJECT UFCPAGE NO. 2/2

In talking w/ the IPI team members, I'm trying to assess the data that has already been collected...

Very curious about the unscheduled maint. portion of workload. Will get comparisons from civilian mfg. ops. to see what percentage of their mx comes from unscheduled work, as well as the impact & how mgmt deals w/ it.

WAITING ON parts - the "system" won't release parts sometimes to the "floor store". Is this a budget problem, a red-tape problem or actual availability problem?

"system" - warehouse across base - this is local, but ordered parts from "floor store" can sometimes take a long time to get to MX.

Is it reasonable to accept that UFCs can be off the line (AF field sites) for months at a time? What kind of inventory are we talking? How many spares are in the system? Do acft sit on the ground waiting for repaired UFCs to be returned? Or does the AF have an abundance of UFCs in the sys so that the process can work at its own pace?

ENGINEERING NOTES

EMPLOYEE LKBDATE 1/77PAGE NO. 1/4

RCC _____

SUBJECT _____

met w/ Maint Control / Continental Airlines / Houston
 (GATEWAY offices)
 Responsibilities of MAT control =

- Monitor and follow up on all delays, but specifically
 MX delays
- Also started tracking repeat write-ups in the last year or so

Daily conference calls w/ other MX hubs

Cleveland
 Newark
 Denver
 Houston

- They together research problems, including history of problems
- Help research on Placards (when a deviation
 to MEL occurs)
 < make sure delays are coded properly >
- according to MAT control, each maint hub handles
 all types of acft, except engines - these are
 overhauled in LA by a vendor.
- Certain office in MAT control handles corrections
 on logbook entries,
- Records office tracks jobs, how long it takes
 for job to be completed, whether parts were
 available or had to be transferred, and
 monitors write-ups and "fix" entries for
 accuracy. (When a questionable entry
 appears, they send it down to MAT control)

ENGINEERING NOTES

EMPLOYEE UCSDATE 177PAGE NO. 2/4

RCC _____

SUBJECT _____

Planning and Records work together to do all plans & scheduling work. MAT control, maint hangar supervisors and Stores (parts/invent) sit in on weekly planning sessions.

Planning office and a mx budget office incorporated. Houston office runs all the mx hubs - uses conference calls to bring in the supervisors to the weekly mtgs.

Most of the A & B checks are done in conjunction w/ ROWs, where unscheduled maint is also accomplished. Unscheduled mx takes up about 5-7 % of their regular work.

MAT control has a shift change log, which is in compliance w/ FAR pt 121.

Deferred maint (from placards) usually cleared in 3 days, as Planning will fit in that work w/ the scheduled mx.

They use SEPTRE II as the maintenance computer system. They have a second system which is used by non-maintenance departments, so MAT control uses both systems to remain integrated w/ the entire system. Second sys is for flight scheduling and other departments (reservations' works on this)

SEPTRE ties all the areas of the operations together. Also serves as a time clock and a library reference and work cards.

DDB SECTION CODE _____

DDB PAGE NO. _____

Attachment 1

010019

follows

MAY WE HELP YOU
LIGHT-PEN DESIRED JOB-POSITION OR TASK
JOB CLASSIFICATIONS

- | | |
|------------------------------|----------------------------|
| 1. LINE/HANGER MECHANIC | 2. SHOP MECHANIC |
| 3. MAINT. LEADS/SUPERVISORS | 4. MAINTENANCE CONTROL |
| 5. ENGINE/COMPONENT PLANNERS | 6. A/C PLANNERS |
| 7. RECORDS - MAINTAIN | 8. RECORDS - DISPLAY |
| 9. INSPECTORS/Q.C. - HANGER | 10. INSPECTORS/Q.C. - SHOP |
| 11. ENGINEERING | 12. RELIABILITY |
| 13. FLIGHT CONTROL | 14. MATERIALS ANALYST |
| 15. TECHNICAL SERVICES | 16. LEAD OR STOCK CLERK |
| 17. PURCHASING | 18. MANAGER |
| 19. CATALOGER | |

TASKS

- | | |
|----------------------------------|----------------------------------|
| 1. INSPECTIONS - DISPLAY/SIGNOFF | 2. ENGR.MODIF. - DISPLAY/SIGNOFF |
| 3. ENGR.MODIF. - MAINTAIN | 4. WORK CONTROL |
| 5. PARTS/SUPPLY ORDERING | 6. A/C TIMES & FORECAST |
| 7. COMPONENT MAINTENANCE | 8. A/C MAINTENANCE |
| 9. EMPLOYEE & LABOR | 10. VENDORS |
| 11. P/N & PARTS REQUEST MAINT. | 12. PART ROUTING & TRACKING |
| 13. SERIALIZED RECORD MAINT. | |

SEPTRE menu

010020

Attachment 1

ENGINEERING NOTES

EMPLOYEE LIB DATE 177 PAGE NO. 3/4
 RCC _____ SUBJECT _____

Approx 4.4% of Acft fleet down for major maint (overhauls & mods) at any given time. When it gets ~~over~~ ^{over} 5%, red lights flash and they put people on overtime!

Regular shifts are 3 full shifts, 5 days a week, no weekends, no overtime!

Maintenance Hangar / managers -

Currently AVIAL does engine overhauls in L.A. for large acft (747s, etc)

Small acft (DC-9s & MD80s) have engines overhauled at Houston's Intercontinental MX hangars

Hobby Airport handles acft MX - specifically D checks - on MD80s & DC-9s.

QA reports directly to VP of Maint^{ops}, not the Dir of Maint Control

They use a Reliability Centered Maintenance program and they are reviewing regs. on a constant basis.

For example, they are going back to Block time for major checks, as opposed to the phase system which became popular 15 years ago.

ENGINEERING NOTES

EMPLOYEE LKBDATE 1/77PAGE NO. 4/4

RCC _____

SUBJECT _____

- With a D check, they usually occur every 7-8 years (depending on acft btw 20,000 & 25,000 hrs) and the acft will be down for 10-15 days, (also depending on acft size)
- The reason phased maint is becoming a problem - too rushed for the MX people, and result - lack of quality.
- MD-80 & DC-9 checks (major overhaul) done in Houston @ Hobby
- Most other MX hubs specialize in at least one airframe, although some can do up to B and partial C checks on a variety of acft.
- Small engines overhauled local, but large are done by various vendors.
- SID Program - just coming into the threshold now
A telegraphic AD - comes down through SID program if an discrepancy is found.
- All workers / mechanics are non-union now except for one support shop.

ENGINEERING NOTES

EMPLOYEE PremieDATE 6/26/96PAGE NO. 1RCC MAT PFASUBJECT INTERVIEW WITH EDDIE GONZALEZEDDIE GONZALEZ

SAT - Service acceptance test

RAR - run as received - to determine what needs to be done
for info and to verify customer info on defect

SIT - special investigation team

175 - ^{for} sub assembly

Augg set in - computer test - (ASI)

5002 - series test stands can be used for
several ~~testing~~ different testing procedures
- however, often a unit is dedicated
to simpler tasks

5004, 5005 series stands are more
limited in and less flexible
in regard to the types of tests
they can be used for.

- recently there has been good improvement in
the rejection ratios (SAT test)

- This $\uparrow$ is due to the RAR initial tests

NOTE:

MR. Gonzalez seemed ~~knowledgeable~~ ^{Knowledgeable} and cooperative

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ENGINEERING NOTES

EMPLOYEE

PROMO

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6/27/90

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1

RCC

MATPFA

SUBJECT

INTERVIEW WITH BUDDY PELAYO

GAS GENERATOR ARCTA (Buddy Pelayo)

421 CAMSHAFT Repair press approx 12 hrs - then rendered
then taken to 5004

Best way to determine times and rates of occurrence
is to talk to craftsman

(this is going to be difficult)

Sketch-hazy info from MR. Pelayo
indicates the need to talk to
craftsman (although he was cooperative)

ENGINEERING NOTES

EMPLOYEE PremioDATE 6/28/90PAGE NO. 1RCC MAT PFA

SUBJECT _____

EQ history record

question? ~~but~~ it appears that a majority of down time repairs for the test stand ~~is~~ involves labor only ~~to~~ and only a small relative expense in material cost (parts?). Why?

- Is this caused by ~~old~~ ~~to~~
 • equipment wear?

• maint. procedures

• setup problems

• improper test equipment

— difficult to tell, data appears to be dirty

— Investigate types and causes of repairs and down time

— breakdowns are almost a daily occurrence

— often several different problems in a given day. Do these multiple breakdowns (in a given day) happen at different times or on a single block of down time.

investigate

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ENGINEERING NOTES

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 RCC MAT PFA SUBJECT _____

Mr. Felipe Cano (short interview)

5% of ~~Augmentors~~ ^{Augmentors} will have to wait on DB (dist body)

{ Rudy Vania works a HC - best one (mechanic)
 { Leija, Joe } these mechanics are best knowledge of operations

RARs are used as primary test to determine what is to be done

OCM - team then plans the required repairs where?

(9-12)/20 DBs need extensive repair
 (apx 50%)

~~Few DB need repair - where?~~

Augmentors 40% need separate work.

ENGINEERING NOTES

EMPLOYEE

Primo

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RCC

SUBJECT

Clyde Hartfield's operation

- Augy set in Low 3 shifts Med 5 shifts Max 21 shifts,
apx time for operation

- Little diff when using 5002 for augy set in <
- must plug a line (Augline)

- Manifold pressure problems causes most shut downs
(pump problems)

Systems

- usually when one machine goes
down all in system fail

because common hydraulic feed
system and common computer

- most problems with machines

→ PFZ, can be most common problem
in 5002 - take apart and replace wear points
→ other types of problems < stepper motor leakage (controller)

- ~~base~~ on 5004 - sometimes switch test stands
if part won't pass

- GARY STUBBLES - expert on Hamilton

- usually maint comes to repair in about
1/2 hr - (immediate response)

- Sometimes for 2 times a year - vacation, Christmas etc.)
an all day wait for maint.
this seldom occurs and the problem
may already be fixed

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ENGINEERING NOTES

EMPLOYEE Premo

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SUBJECT TEST STANDS

Danny Cavagos

runs 5005's (operator)

very knowledgeable

Interview with Clyde Hartfield (cont)

- often on 5004's when a part is when a gas generator test is failing there is some difficulty in determining if the cause is the test stand or the GG.
- Often the GG is moved to another machine to see if it will pass on a different machine... superstition or fact?
- the switch takes approx 1/2 the time it takes to plumb a GG (about 1 hr)
- in effect they use a GG as a diagnostic tool for the test stand.
- this switching usually doesn't take place on the 5002 stands.
- would tighter adjustment and calibration spec's reduce this problem?

Call

- Chris Moran

- ask about missing machine records

- sorting of records

- transfer of records to disk

Monday

Tim Mazatti

4747 phone number

Tim Mazatti -

Lamar Fifer - knows

VAX system

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~~4747~~

~~4747~~

04 358, 0436: missing records

010028

ENGINEERING NOTES

EMPLOYEE Joe MontanoDATE 10 July 90PAGE NO. 1 of 3RCC MMTPFASUBJECT MM brief on UFC'sMeeting Notes and Observation of MMTPFABriefed by Don Heckamp - MMPurpose of Meeting: To gain customers (MM) view on MAT problems and how it impacts MM's mission of supplying field units with UFC's.

Depot inputs are driven by number of failures in the field. Number of inputs varies from month to month. Recent monthly average has been around 100 units. It seems that the average is seasonably affected. The highest input months are from May thru October. This is most likely due to the spring and summer months being the highest flying months.

Time in the pipeline from field units to the depot was unknown. The depot pipeline to UFC RCC is also unknown. Repair Cycle time is approx. 59 ± ? days

UFC unit cost is \$160K

MM pays MAT \$16 to 18K repair cost (F15)
\$20K " " (F16)

Four separate repair facilities worldwide:

1. SA-ALC - provides support worldwide
2. IHI (Japanese firm) - supports PACAF units
3. PERC - supports USAFE units
4. Bendix - contractor support - handles overflow from SA-ALC

(Overflow from IHI and PERC is handled by SA-ALC)

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ENGINEERING NOTES

EMPLOYEE Joe MontanoDATE 10 July 96PAGE NO. 2 of 3RCC MMATPFASUBJECT MM brief on UFCs

Number of UFC's handled by other repair facilities last quarter:

PORE - 75 F15

" - 63 F16

Bendix - 60 F15

" - 32 F16

Estimated UFC's in repair cycle 600

Units of SA-ALC 408

Units in repair cycle - SA-ALC 206

Total USAF UFC assets approx. 2700

Recommendations:

It would be interesting to compare data from other UFC repair facilities with SA-ALC data and find out if there are significant differences in output and repair cycle times. Also:

1. Number of outputs vs inputs per month
2. Work flow paths and times per task.
3. Personnel skill levels accomplishing each task
4. Number and types of test stands and test stand reliability.
5. Length of times components spend on test stand.

Conduct an evaluation of test stand procedures with Bendix and Pratt Whitney assistance, to determine if testing of sub-components or UFC can be shortened. Current test times seem to be excessive and it's not clear whether any benefits are gained on UFC reliability.

ENGINEERING NOTES

EMPLOYEE Joe MontanoDATE 10 July 80PAGE NO. 3 of 3RCC MATPEASUBJECT Min Brief on UFCs

By such lengthy testing, if test points are being repeated from individual subcomponents (GG, AG, DB) tests and repeated again at a complete UFC test.

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ENGINEERING NOTES

EMPLOYEE GARDNERDATE 10 July 96PAGE NO. 1RCC MATPFASUBJECT UFC mm Pipeline

Susan Schutte (~~MAWFT~~), Joe Montano (INCAIR-F100s), and myself met with Ron ~~Hedtkamp~~ (mm). Ron ~~was~~ described the process he performs and how mm manages the UFC repair cycle.

He is responsible for negotiating # of items repaired with MAE (UFC repair area). He has to try and match field demands with depot capacity, and mm budget constraints. He felt his biggest problem was a lack of usable data on RCC capacity/flight time. He also indicated that he expected his function to be eliminated by the reorganization in October.

Mr. Hedtkamp was also somewhat concerned about the number of UFCs that were WIP at various locations. There were a total of 210 units at various contract repair facilities and 408 on Kelly AFB. At an average cost of \$160K per UFC this represents an inventory cost of \$98.9 million (at a U.S. savings bond interest rate of 7%, this contributes almost \$7 million a year to the federal deficit). The 618 units in WIP inventory represent about 25% of the total USAF inventory. Ron indicated that he felt that was not an unreasonable volume of failed units in an average population. I'm not sure if I agree, but plan to ask Lisa Baumgardner (Commercial Aviation expert) to find out what commercial aircraft fleets normally experience. Of the 408 on base, 266 were in the UFC repair facility. The rest were in MAE, in the DS warehouse, or in some temporary status (transit) in-between. The pipeline between field & depot was described as shown on the diagram below:

DDB SECTION CODE 1.0 / 7.0

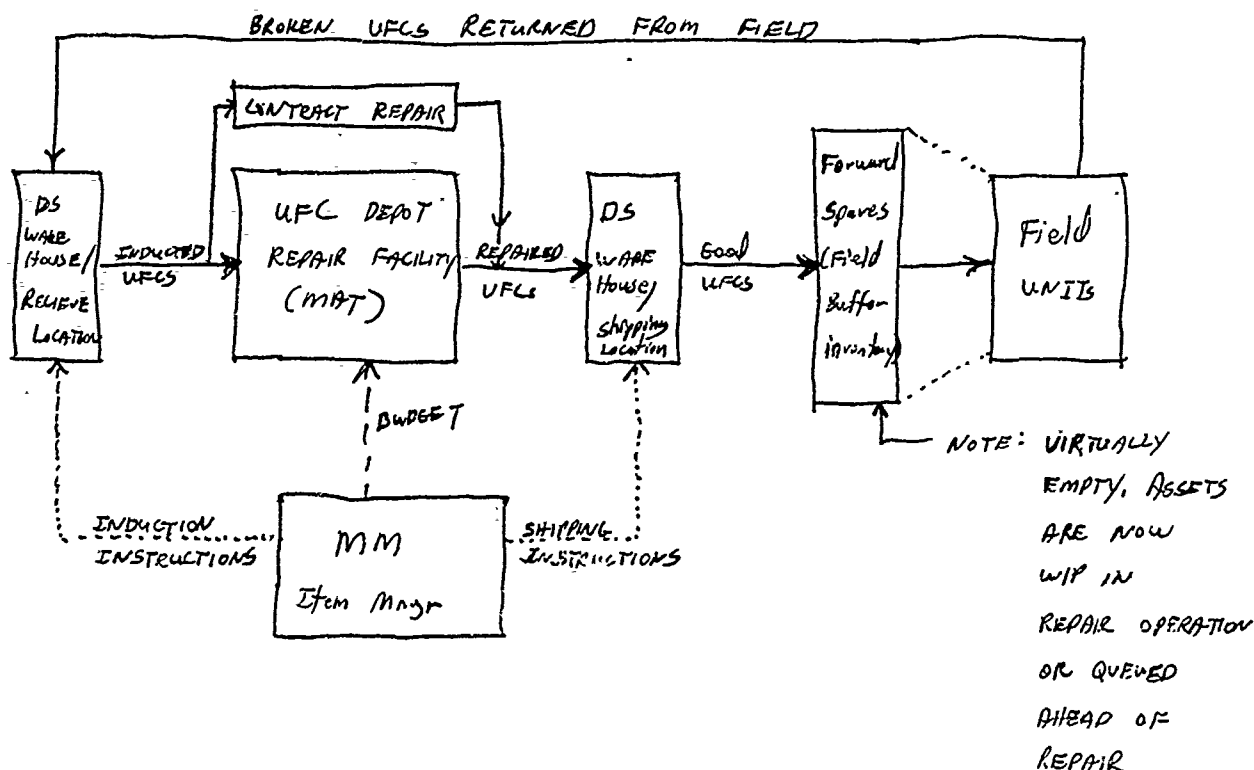
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ENGINEERING NOTES

EMPLOYEE GARDNERDATE 10 July 90PAGE NO. 2RCC MATPFASUBJECT UFC MM PIPELINE

UFC PIPELINE



TOTAL PIPELINE TIMES ARE UNKNOWN (TO US). The UFC depot has a published flowtime of 59 days. We are in the process of determining actual average historical flowtimes & distribution.

ENGINEERING NOTES

EMPLOYEE GARDNERDATE 10 July 70PAGE NO. 3RCC MATPFASUBJECT UFC mm PIPELINE

Mr Hentkamp also provided the attached charts showing UFC failure/Repair/MICAP rates for the last 8 months. Average monthly failures have been running at 98/month with a σ of 20.3, while production has been running at 91/month with a σ of 16. To ever reach a JIT flow, the repair capacity must equal average monthly failures plus 2σ . At current failure rates, total Repair capacity should be 140 ufc/month. A least squares extrapolation of current failure rates indicates a trend toward increasing rate of failures. The effect is not pronounced and should be plotted with a larger sample space before any conclusions are drawn. Mr Hentkamp indicated that failures normally increase from May-Oct as summer weather tends to boost flying hours and, thus, increased use of Field UFCs. I think an optimal total capacity for the ~~repair~~ depot repair operation should be about 140/month. This will allow a JIT flow at current operational levels, and keep WIP levels under control.

Total Average monthly production rates were given as:

Pratt & Whitney O'scos Repair	- 15-20	(USAFE)
IHI	- 5	(PACAF)
Bendix	- 20	(CONUS)
SA-ALL UFC Depot	- 100	(CONUS everywhere)

Total = 145-140

why is there a WIP build up?

Ron Hentkamp advised us to speak to Wendy Walden - UFC item manager, for more detail on the pipeline. Susan Schottle agreed to identify a contact in DS (Supply) to help us identify total Kelly AFB flowtimes.

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ENGINEERING NOTES

EMPLOYEE LKBDATE 204PAGE NO. 1/2

RCC _____

SUBJECT civ mx comparison

VISIT: NWA / Minneapolis (HQs - for all hubs)
 Plans & Scheduling dept.
 TRAINING / MAT control

Met 1st w/ the mgr of Reliability Control -
 Data collection and evaluation controlled here.

Reviews for procedural rewrites are initiated at this level. She told me that the majority of unscheduled eng. mx comes from bird strikes, other FOD ingestion and pre-flight engine run-ups. Very little problem w/ in-flight write-ups that cause engine teardown.

Usually, unsch mx of engines do not end up requiring EHM (Eng Heavy Mx) unless:

- life limits are getting close
- boroscope insp shows more damage
- long time since last heavy maint.

(but no in-flight problems)

Engines seem to stay in service more when brought in for unscheduled and have partial or full teardowns in EHM -

However, price gets higher due to parts changed more frequently and labor costs raise somewhat, but not significantly. Because you zero time under EHM, it reduces amount of removals for scheduled reasons.

PROBLEM: HIGH INFANT MORTALITY RATE WHEN PARTS COME OUT OF SHOP (ON ANY COMPONENT)
 - STILL TRYING TO REDUCE THESE STATS?

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ENGINEERING NOTES

EMPLOYEE LKBDATE 204PAGE NO. 2/2

RCC _____

SUBJECT NWA

USING new methods of eng. performance monitoring
 - right now, there are sharp shifts in performance,
 which indicates a problem - but they expect
 that to smooth out once the system is integrated.
 - part of this has been a switch to more
 on-cond inspections on line -
 - part of this is some new equipment
 (state-of-the-art eng. monitoring)

Have about 40 extra engines (spares) of all
 diff types in the sys - several are located
 overseas where leasing is a problem.
 - the rest are split between US hubs.

When there are not enough in stock due to spikes
 in the unscheduled mx, they lease from
 AAR. ~~in the stock~~. The leasing group is in
 Chicago. AAR uses another overhaul, 3rd party
 facility, rather than do eng mx themselves.

ENGINEERING NOTES

EMPLOYEE LKBDATE 205PAGE NO. 2/5

RCC _____

SUBJECT _____

TRAINING Cont -

Redesigning of inspection programs; areas where changes have been made:

- individual tasks are always scrutinized for redundancy in the overall prog.
- utilize downtime better
- keep depot-level mx moving quickly
- doing "packaged A" checks
- SID program
- Heavy mx prog.
- Maintain or improve safety levels

Engine overhaul facility and computer maint-tracking sys

Septre II is utilized here. When I mentioned that Continental used it, too, I was told "Republic had it first, utilized it completely. When Northwest merged w/ Republic, NWA had been all manual. In 4 years, they brought NWA on line and ~~that~~ now we're the only airline using Septre in its entirety."

We following some parts through the system; at the same time, I got a run through of how the eng line runs and how units/modules and all parts are tracked.

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ENGINEERING NOTES

EMPLOYEE LKBDATE 205PAGE NO. 3/5

RCC _____

SUBJECT CIV MYEng. line cont.

Modular concept for eng overhaul well underway.

When an eng is determined to need EHM, scheduling puts the serial # of whole eng. into sys.

This reads out what serial #s are on the eng per module. You can go, then, to each module and pull up last major maint on that module, what eng (if any) it was ever on before, and any major write-ups (for FOD or eng failure) that occurred on that engine when the module was attached.

You can break down each module similarly with any parts that have serial #s.

All modules stay together except for parts that must be discarded. Rework parts (if they can be reworked in time) go back on same module.

All modules go back to same engine serial # unless waiting on a module would cause a big hold-up.

With scheduled overhauls, it is easier to keep all modules together, as parts are ordered in adv. w/ unscheduled fix this is where the most deviation is found.

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ENGINEERING NOTES

EMPLOYEE LKBDATE 205PAGE NO. 4/5

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SUBJECT CIV MX

EACH serial # on each part of each module of each engine can be tracked at any time.

Eng. line looks rather chaotic from a walk-through standpoint, but a demonstration of the computer sys convinced me that it was organized.

We could walk over to a part (which are all tagged w/ serial #s) and scan them w/ a part scanner or punch in the serial # by hand - -

then the computer would tell you where the part was, what had been done, what it was waiting on (if anything) and what module it was pulled from.

Cleaning is done at each module repair section, except for an overall wash-down prior to disassembly.

→ PARTS ARE ordered through Septec as Min. on-hand # shows up in computer.

All info on inventory can be accessed by Plans, Scheduling, Production, Budget, and systems/ops. (Probably other areas too!)

Several vendors available for most parts, with 1st choice, 2nd choice, etc when it comes

ENGINEERING NOTES

EMPLOYEE LKB DATE 205 PAGE NO. 5/5
RCC _____ SUBJECT CIVIL

to ordering on demand. cont. - eng / computer

Usually parts are available through regular sys, however.

Good to have access to other vendors if necessary - keeps process running smoothly.

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ENGINEERING NOTES

EMPLOYEE LKB
RCC _____DATE 206 PAGE NO. 1/1
SUBJECT non-chem. paint stripping
DRY ICE

Watched Dry ICE method of paint stripping
at MDC in St. Louis.

Great on metals, tore up composites and
didn't really clean our carbon'd parts
very well.

Couldn't use it for soft metal, either, as
it damaged the structure.

So, essentially, good for large areas of
solid airframe where there are no
areas of composites or thin layers
of metal (edging, etc.) —

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ENGINEERING NOTES

EMPLOYEE LKB
RCC _____DATE 207 (Am) PAGE NO. 1/1
SUBJECT Bleached starch / plastics
non-chem paint stripping

St Louis -

Saw demonstration at House of
Tools & Engineering -

1st was Bleached Starch media -

Did well on composites, w/ little
or no damage.

Cleaned carbon from parts fairly well.

2nd was a Plastic media -

saw demo on carbon'd parts only
did a great job even in small
edges / crevassesbrought parts back to take to NDI lab
for cleanliness insp.DDB SECTION CODE 1.0

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ENGINEERING NOTES

EMPLOYEE UKB DATE 207 PAGE NO. 1/2
 RCC back in San Anton SUBJECT civ comparison

PHONE conversation - as follow up to visit in June
 Continental Airlines - Plans & Scheduling / GATEWAY
 Houston, TX

Dealing w/ unscheduled maintenance that affects both
 line mx and off-line mx, tracking of delays and repeats
 is done daily.

Hubs have conference calls every morning (about 10 AM) w/
 P&S personnel in Houston - Hqs.

Placard research & properly-coded delays work into this
 tracking sys / Hub conference.

Unscheduled maint that occurs regularly becomes info
 for rewrite of mx procedures. Updates are suggested
 quarterly. This, in turn, affects depot-level maint
 for engines and airframes.

Major mx of large engines done in Houston, but capacity
 is not high for this right now, so outside vendor
 picks up excess... This includes engines down for
 unscheduled mx if cannot be fit into shop ASAP.

Price is higher for outside vendor, so plans to expand their
 own facilities are underway. However, outside vendor
 (3rd party mx) returns work promptly, so its better
 that having engines/parts sitting around waiting
 on test stands or whatever.

All Mechanics are A&Ps & half of those have AIs, so
 there's no shortage of people to sign off work!

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EMPLOYEE CCB

DATE

20-7

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RCC

SUBJECT

CIV MX

PARTS (stores) gets involved in daily conference and in planning meetings.

— Access to several vendors is available at mid-level management. Mngmt has to justify why they ordered what if prices are exceedingly high — but management is definitely empowered.

Regular scheduled mx — parts are ordered thru the sys w/ bids going in for lowest (but high quality) parts.

Of course, all parts bought are FAA-approved, so quality shouldn't be an issue.

Leasing on engines will occur when necessary, as total spare inventory is very low — about 35 for all types-total.

Engines cannot remain out of service for any length of time! They have more extra components, however.

Mentioned my question of % of failed UFCs in system — actual # was not known by my contact, but he estimated 15%.

There are certain components that are overstocked due to high-breakdown stats... however, I couldn't get exact #s.

I Areas of possible improvement in human factors were partly indicated in earlier notes. Others can be mentioned now, but it should also be noted that (A) some observations with relevance to human factors are already being offered (as they should be) by the on-site MDC team, and (B) the Air Force will not commit substantial resources to the UFC test and repair facility because its role is perceived as declining over the next 15 years.

Regarding A and B above (and postponing notes about possible human factors improvements): First A: A representative suggestion by the MDC on-site team with human factors relevance is the suggestion that lower-skill-level persons be assigned the task of plumbing & de-plumbing controls on test stands. The fact that this suggestion is not implemented right away is indicative of the very complex process / people / equipment interactions taking place in the shop. Human factors as a methodological approach (and as a profession) would be remiss to exclude these interactions from notice and to concentrate solely on the "local" environment of human / UFC / test stand or repair bench. The actual situation in the facility that * results in less than satisfactory throughput is primarily found ⁱⁿ the complex

process / people / equipment interactions and not in "local" environments.

Now B: It appears that only relatively inexpensive approaches will be considered by the Air Force due, understandably, to the perceived role of the UFC facility in the future and to ever-present budget conditions. Just as importantly, customer expectations may constrain recommendations to the point that they (suggestions and recommendations) match pre-existing operating philosophies. This situation might lead human factors input toward inconsequential items; that is, observations that pertain to operator or craftsmen comfort or satisfaction but have little to do with shop production levels.

A related matter is management pressure on the shop to increase production. Such pressure may reduce the willingness of shop personnel (operators, craftsmen, "off-site" or test stand maintenance people, and supervision) to contribute to the goals of a process study because they believe that their time is better spent on their regular work.

These points (A & B) suggest that an effective human factors approach is the study of information format and transmission in the

facility at some manageable level. Information format and transmission could be an effective (good returns on investment) area of intervention under the existing conditions because⁽¹⁾ there are significant gaps in information revealed by conversations with facility personnel * (Dave Biber, Merilyn Henderson, Frank Mann), (2) properly formatted information has been regularly shown to improve human performance, and (3) many information-oriented interventions are inexpensive.

Now we can indicate areas of possible improvement with relevance to human factors.

These observations are not limited to only information-oriented interventions, but our belief is that information-oriented ones would best meet the needs of UFC test and repair facility.

1. For RAR test, report all out-of-limits results together from the test stand computer. This action will save operators from searching through many pages of printer output and may help to formalize the repair decision process. Requires changes to test stand software.

2. Dedicate certain test stands for RAR. During initial testing, a UFC may have more contaminants

* These people are very knowledgeable, they were instrumental in identifying information needs.

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which can clog test stand filters. This condition results in more down-time for stands used for initial flushing and checking. Possibly, dedicated test stands could be fitted with different filters to reduce down time. This observation may be from Greg Gardner.

3. Increase retraining and recertifying of operators
4. Reduce the number of paragraphs (tests) in RAR to those most likely to uncover problem conditions.
5. Provide^{to} OCM team information regarding repair path of individual units. Track by serial number.
6. Standardize RAR procedures. Currently, according to Dave Biber, an operator may conduct test procedures without making corrective adjustments to a control, or may conduct tests and make adjustments to a control in an effort to bring a control to "within limit" condition. This option suggests to us that the objectives of RAR are not clearly understood or shared throughout the facility.
7. Turn-over logs and notes that provide continuity information on UICs from shift to shift may not be in an optimal format. We have not been able to inspect these materials

or talk with operators about their use, but it seems reasonable that time could be saved if an operator could quickly determine the status of a control.

B. Related to #1 above, advisories, tips, novel approaches and other information distributed to operators about UFC test and adjustment (or information distributed to craftsmen about repair) might be an area of potential improvement. Guidelines for producing such information in clear, easy-to-follow format are available from many sources.

II. This human factors evaluation, as indicated above, suggests that information transmission and format is the best area for study in terms of efficiency/ productivity influence and low cost. Characteristics of the facility should guide any detailed study or should be taken into account with proposed interventions. The following are characteristics of operator and OCM team information that we observed:

1. Tech order (TO) instructions are oriented to overhaul, not repair. They are outdated, considered to be "generic," and do not include procedure logic trees or diagrams.
2. ~~Test and~~ Adjustment procedures appearing

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SUBJECT _____

- on test stand computer screens are also considered "generic" by operators.
3. Operators differ in their reliance on provided "generic" instructions. They are at liberty to attempt alternate approaches and improve their knowledge by working novel or uncommon problems.
 4. Operators may enter notes ~~at~~ regarding uncommon procedures into notebooks. Apparently, these notes accumulate into something like a "personal technical journal."
 5. Operators may share (often or seldom?) their discoveries of effective approaches with other operators, usually verbally. Operators who hear verbally presented ideas and tips may write these things in their notebooks. There appears to be ~~no~~ data on the accuracy of operators' notes.
 6. The OCM team distributes tips and novel solutions by memo or advisory on paper to operators.
 7. Frank Mann, before becoming OCM Team leader, started a trial system whereby operators in his unit would write their diagnostic and adjustment procedures on sheets of paper and turn them in to him. Mann's intent was to sort through the written sequences and determine the most effective troubleshooting sequences for specific problems. Mann told us that his system was popular in his unit because it increased the amount of shared information about specific problems. He was promoted before collecting enough of the forms (sample is attached) to derive optimal sequences.
- (page 9)

ENGINEERING NOTES

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8. A pool or corpus of knowledge appears to exist in the test facility (and undoubtedly the repair facility as well) regarding procedures and corrective procedures that are not found in the TO, nor on test stand computer screens. This pool of information is the collective, specialized knowledge of operators, ACM team members, supervisors, and notes, memos, etc relevant to corrective procedures.
9. A complex interaction between operator, off-site repair, UFC condition, and test stand condition also characterizes information. Probably many effects here, but size of effects is unknown.

These characteristics point to a possible technique or method to capitalize on operators' specialized knowledge. Essentially, the method calls for a computerized data base containing diagnostic and adjustment (corrective) information. We envision this to be a low-cost, PC-based, evolutionary build-up of troubleshooting logic trees that supplies the requesting operator a paper printout. We plan to describe this idea in greater detail and send the description to the WDC on-site team in 2 to 3 weeks.

- III We note that in telephone conversation with Greg (site leader), it was decided that human factors evaluation could concentrate on one Task Order, namely the UFC facility. This decision would permit a more thorough analysis of one area, rather than a brief examination of two or more areas.

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ENGINEERING NOTE

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IV It seemed appropriate to human factors specialists and to the site leaders to focus attention on a critical decision point within the test and repair process. While we did not hold to this target, our focus brought us to consider information processes related to a critical decision point. Thus, our intervention idea, which we plan to mail in 2-3 weeks, uses an M&I test leading to a "de-mate" / don't "de-mate" decision as a vehicle for description. We believe the intervention could be widely applied - eventually to cover all test paragraphs.

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TROUBLESHOOTING DATA

UFC SER: # 32522 ITEM UFC DATE 19 Dec 89 T/S 2-010SPECIFIC PROBLEM, ENTRY #, TEST POINT, DESCRIPTION Entry #11 T.P. 5.000Unable to adjust flowsDATE 12/20/89 T/S 033 Problem with Div's 1st Shift was having to turn max trimmer 15 turns to
get flow between 7210-7610, found Plap Trim working too far down Entry #25

TROUBLESHOOTING STEPS TAKEN IN SEQUENCE:

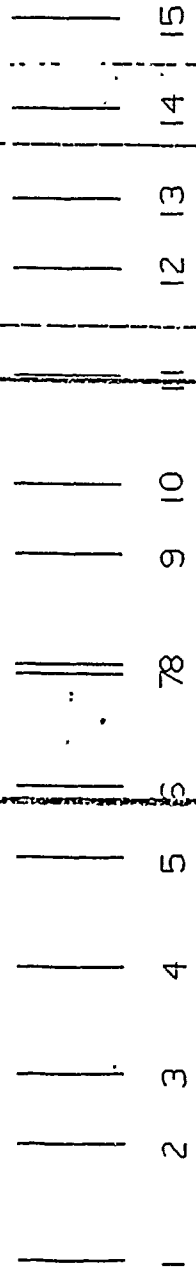
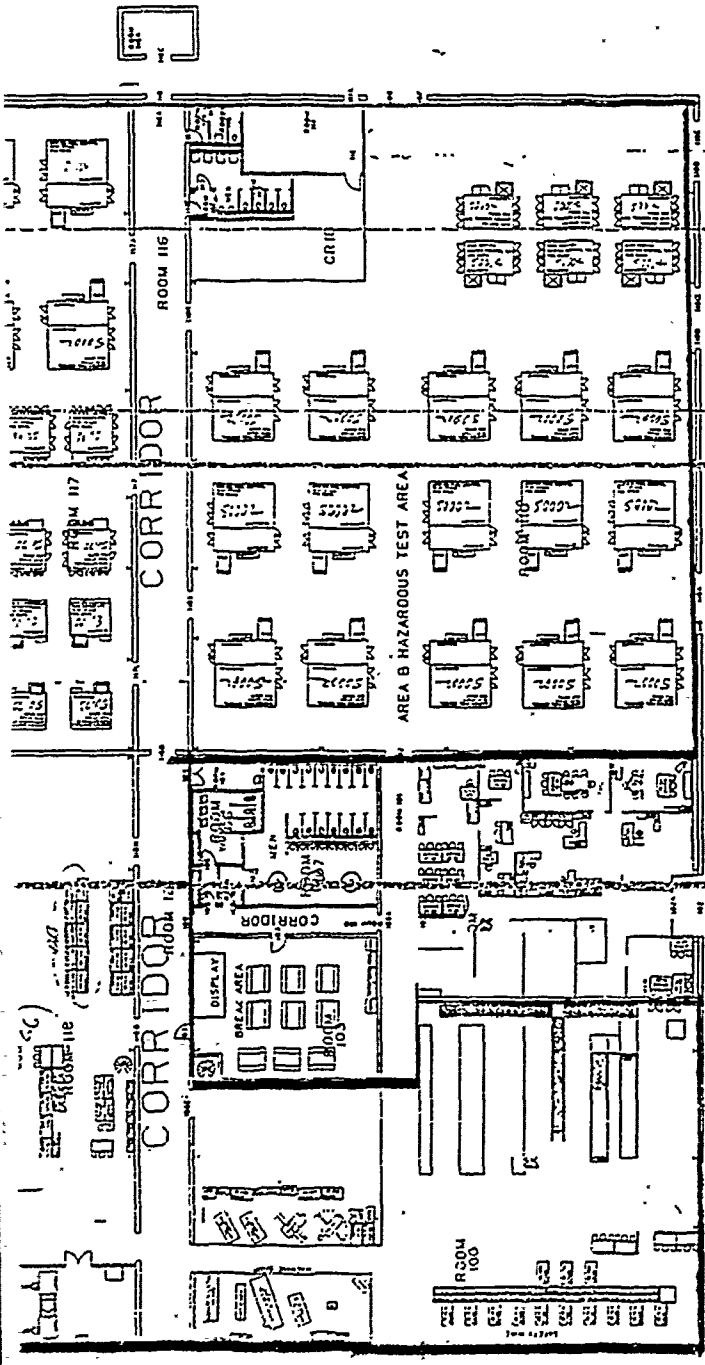
1. Pre-set the accel cam follows, MV Boost Piston & N2 servo. OK now.
DATE 12-20-89 T/S 033
2. 1st - They backed out on Plap Trim working where max flow could be obtained @ 10 turns
3. 2nd Shift - Went back and brought & linearity back into limits.
4. Adjusted N2 Cam follow lower shaft, N2 request servo valve and P.L.P. Trim Cam
follows adj and brought governors into limits.

REMARKS:

WHAT FIXED THE PROBLEM? adjusting Plap Trim working adj.SPECIFICALLY, WHAT WAS UNIT REJECTED FOR? Unable to adjust flowsDDB Section: 1.0

010033

2.0
FACILITIES



SCALE: 1" = 20'

B1 D.G. 3 48

F E FAC ROOM B A

9346

8	8.8	0	0.0	9	9.9	3	3.3	5	5.5
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AREA D HAZARDOUS TEST AREA

CORR 1003

COBERTURE

AREA C OVERHAUL

AREA B HAZARDOUS TEST AREA

ROOM 116

R50M
100
$$\underline{Y}$$

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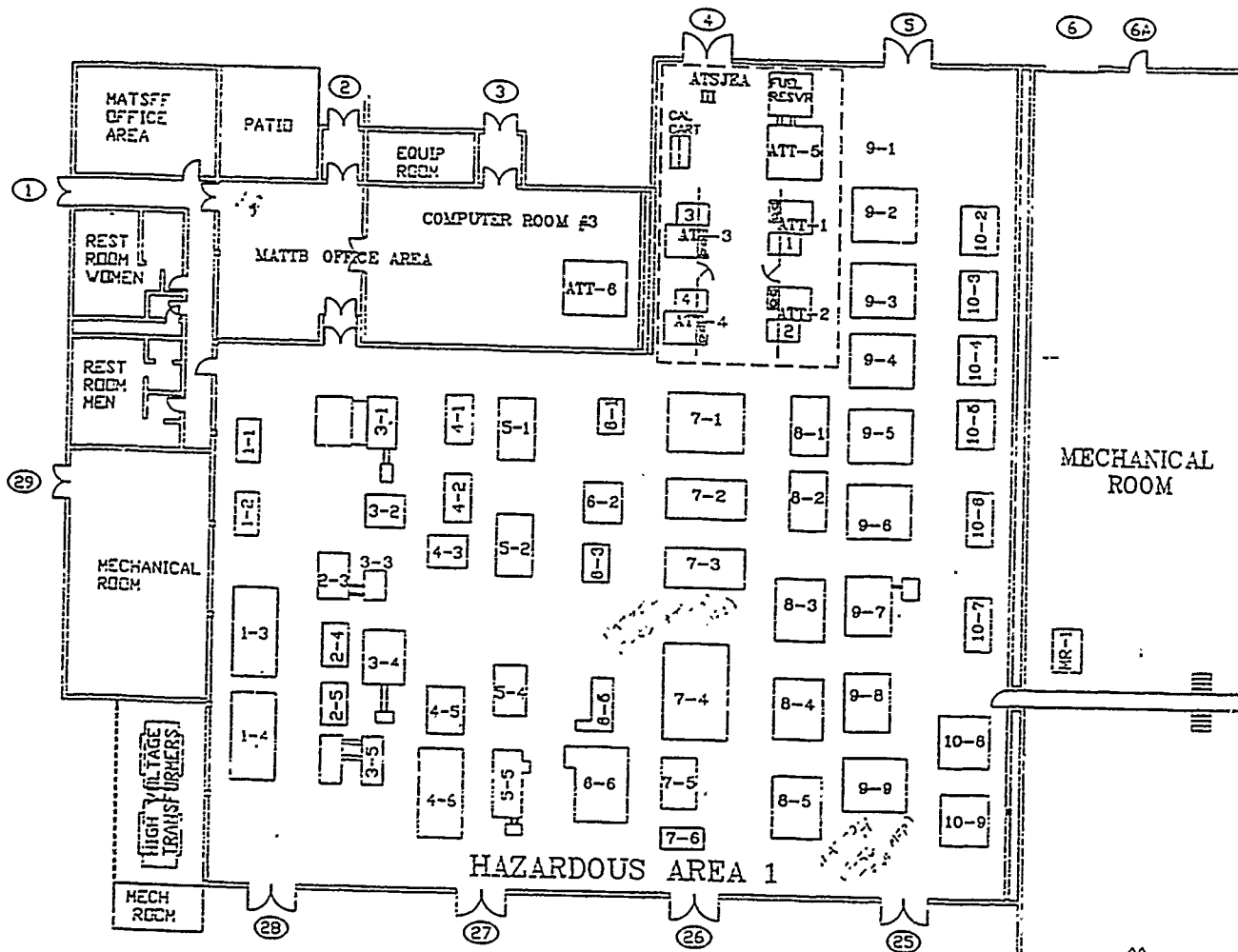
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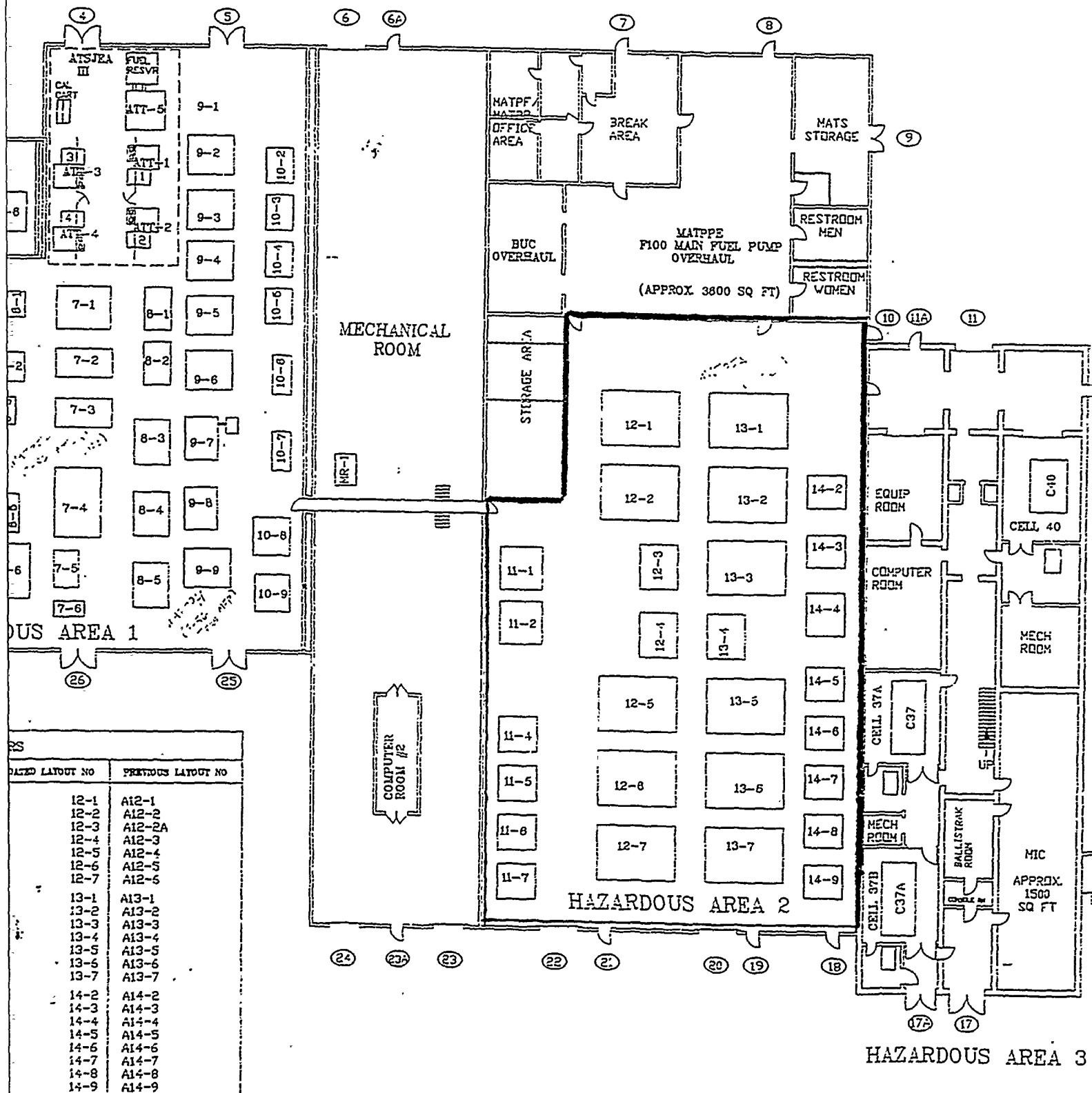
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(UPDA

CROSS-REFERENCE OF BLDG 347 LAYOUT NUMBERS

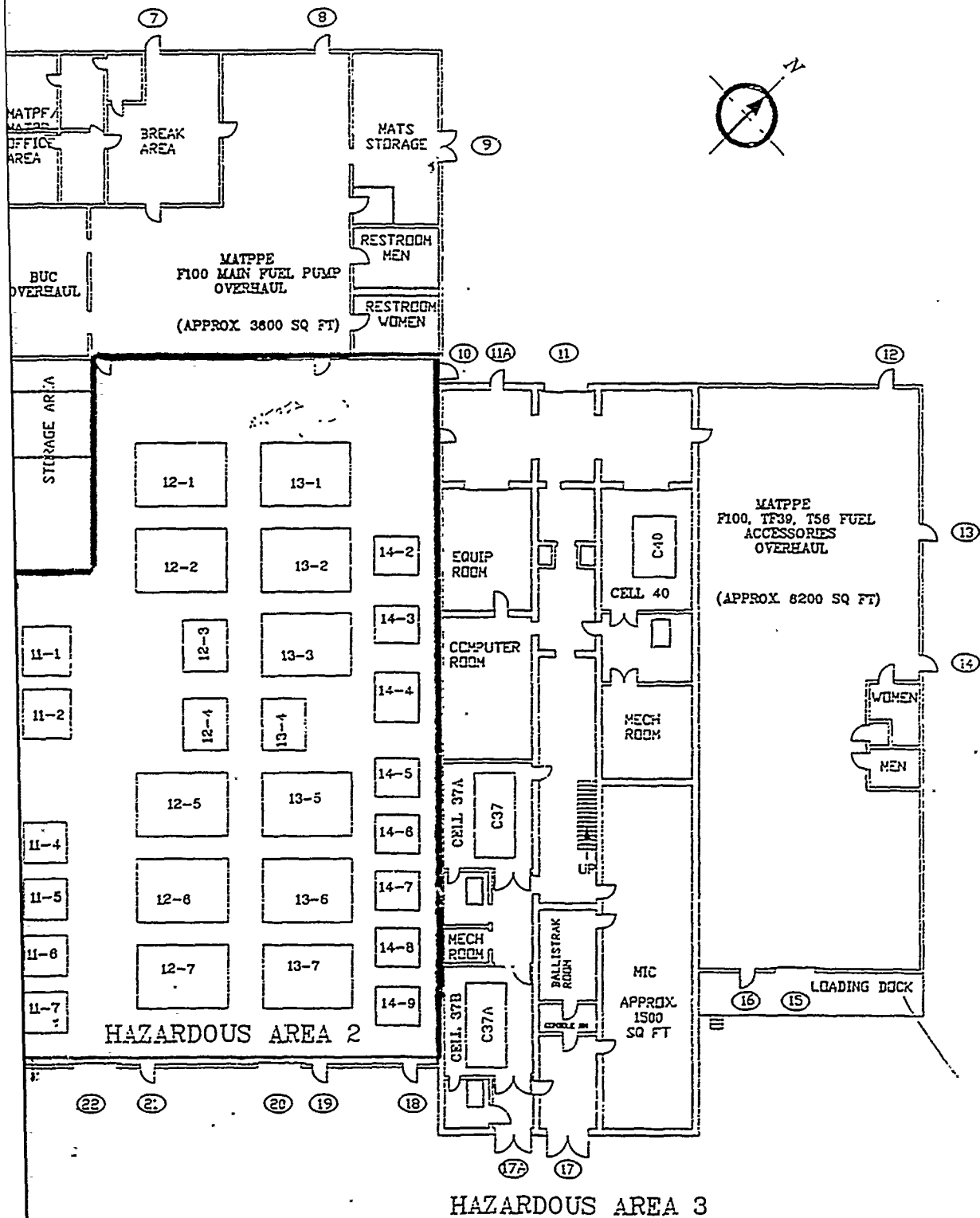
UPDATED LAYOUT NO	PREVIOUS LAYOUT NO	UPDATED LAYOUT NO	PREVIOUS LAYOUT NO	UPDATED LAYOUT NO	PREVIOUS LAYOUT NO
3-3	UNLISTED	8-5	8-8	12-1	A12-1
6-1	6-0	9-1	9-0	12-2	A12-2
6-2	6-1	9-2	9-1	12-3	A12-2A
6-3	6-2	9-3	9-2	12-4	A12-3
6-5	6-3	9-4	9-3	12-5	A12-4
6-6	6-4	9-5	9-4	12-6	A12-5
		9-6	9-5	12-7	A12-6
ATTSJEA III AREA ATT-6 UNLISTED ATT-5 AUX EQUIP ATT-3 7-3 ATT-4 7-4 ATT-1 8-2 ATT-2 8-3		9-7	9-6	13-1	A13-1
		9-8	9-7	13-2	A13-2
		9-9	9-8	13-3	A13-3
		10-2	10-0	13-4	A13-4
		10-3	10-1	13-5	A13-5
		10-4	10-2	13-6	A13-6
		10-5	10-3	13-7	A13-7
		10-6	10-4	14-2	A14-2
		10-7	10-5	14-3	A14-3
		10-8	10-6	14-4	A14-4
		10-9	10-7	14-5	A14-5
		11-1	A11-1	14-6	A14-6
		11-2	A11-2	14-7	A14-7
		11-4	A11-4	14-8	A14-8
		11-5	A11-5	14-9	A14-9
		11-6	A11-6		
		11-7	A11-7		
7-1	7-5				
7-2	7-6				
7-3	7-7				
7-4	7-8				
7-5	7-9				
7-6	7-10				
8-1	8-4				
8-2	8-5				
8-3	8-6				
8-4	8-7				

BLDG 347
(UPDATED 17 OCT 89)



OG 347
ED 17 OCT 89)

3



3.0

EQUIPMENT

276

MEMO

ICWD-275
13 August 1990

Subject: UNIFIED CONTROL TEST STANDS

To: Greg Gardner

CC: Jim Grounds (Kelly Air Force Base), Kent Schien (MDMSC)

Encl: (1) Cost Per Disk By Quantity in \$
(2) Material Compatibility of Hydrocarbon Fuels

From: Sean D. Crosby

1. I Recently completed a quick inspection of the Unified Control Test Stands located at Kelly Air Force Base in San Antonio, TX. I found the units to be quite good and considering that 49 units have been in operation for 10 years, I am sure that the Air Force is well aware of this fact. I do have a few observations that may be of help and interest.

2. The burst disk seems to add more than its share of down time to the program. Rupture of the disk may be occurring due to true over-pressurization. There is some indication this may happen if controls are not reset after a test is interrupted before completion. When the test is resumed, the surge may cause a rupture.

Another reason may be the type of burst disk being used. The disk in service now, made by Fike Metal Products, is an aluminum pre-bulged, rated at 250 psig. The tolerance on the burst pressure is + 10%, -5% and the recommended working pressure is 70% of burst. This puts the working pressure of the disk at 166.25 psig. The stands are commonly operated at 185 psig. This and the fact that pressure is cycled between 50 psig and 185 psig, more than 50 times during a test is causing the aluminum disk undue stress. A disk of monel is better suited for cycling. A nickle disk would also work but would be incompatible with JP-4 (see paragraph 4).

One other item on the disk is that its part number indicates that it is rated at 720F. If it sees a higher temperature the burst pressure will be lower. During my short stay in San Antonio I was unable to determine what temperatures were involved.

None of the pre-bulged disks are rated at 80% of burst. To achieve this you can go to a scored disk which is the only other disk made by Fike which can fit into the present type BU burst disk holder.

The scored disks are more expensive. You will have to determine the amount of down time caused and the time involved in replacing a disk that has ruptured to determine cost savings. Enclosure (1) is a chart of costs per quantity and type of disk.

DDP Section 3.0/9.0

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02P 7SL HSW11-C-17MSH 49:49 MDMSC 14 90 13:49 06. 41 008

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13 August 1990

-2-

3. One change that would save time during set-up would be to use quick-disconnects (QDS) at the 20 separate 1/4 inch hose connections of the Unified Fuel Control (UFC). The time involved to connect a swivel nut fitting and torque it properly is approximately one minute (Ref. MDAC Standard Data C1.21.4.2 and C1.21.24.35). Utilizing quick disconnects should save about 19 minutes per test. Attaching the QDS to the UFC will take no longer than the 37° flare fittings now used.

4. Last I would like to offer a word of caution. I was told that JP-4 would soon be replacing soldered solvent as the test fluid. JP-4 is not compatible with brass, nickle, zinc or bronze (see Enclosure (2)). The following item numbers from the test stand drawings contain theses materials: 33, 40, 102, 103, 524, 539, 547, 580, 635, 636, 651, and 658. There are more but this is a representative list. It also needs to be verified which of these actually come into contact with fuel.

5. If you have any questions or if you have another task that I can be of help with, please let me know.

Sean D. Crosby
Principle Specialist Engineer
MDMSC-STL, 314-233-0077

SDC:dal

030002

COST PER DISK BY QUANTITY IN \$

	1	2	3-5	6-19	20-49	50-99	100-199	200-499	500-999	1000 & UP
MONEL SCORED DISK	460	237	165	91	81.9	77.35	72.8	68.25	65.52	63.7
ALUMINUM PRE-BULGED DISK	103	51	37	20	18	17	16	15	14.40	14

000003

ICWO-275
ENCLOSURE (1)

278

ENCL. (2)

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3.3 MATERIAL COMPATIBILITY

Materials selection for use with hydrocarbon fuels is required in the design of equipment and the aircraft and engine fuel system. Noncompatible metals can cause degradation of the fuel, while the fuel may attack nonmetals and gaskets to function as well as degrading the fuel itself.

3.3.1 Metals

The following lists categorize metals that are satisfactory for use with hydrocarbon aircraft and missile fuels, and those that are not recommended:

<u>Satisfactory</u>	<u>Unsatisfactory</u>
Aluminum and all its alloys	Bronze
Carbon Moly Steel	Nickel
1/2 to 3% Ni Steel	Copper
4 to 6% Chr. Moly Steel	Zinc
300 Series Stainless Steel	Cadmium
400 Series Stainless Steel	Brass
Monel	

3.3.2 Packing and Gasket

The following materials are recommended for use for packing and gasket applications with aircraft and missile hydrocarbon fuels:

Nylon	Fluorothene A
Kel-F	Vynlite
Trithene	Teflon
Polyethylene	Fluorel
Buna N (linear compound MJ-70) for JP-4, JP-8 only	Viton

The choice of material depends upon the temperature level of the application.

3.3.3 Lubricants

Lubricants used in conjunction with fuel system components such as pumps and controls may come in contact with the fuel being transferred. The following lubricants are recommended for use in fuel systems handling aircraft and hydrocarbon missile fuels:

Molykote
Fluorolubes

MIL-G-6032 Grease
Electrofilm Graphite Coating

~~NOT RECOMMENDED~~
ALSO → MIL-G-276176
(NOT ON ALUMINUM)
IN BENZINE

MIL-G-6032 IS GOOD FOR FUEL SYSTEMS
MIL-G-276176 IS NOT GOOD FOR OXYGEN SYSTEMS

ENGINEERING NOTES

EMPLOYEE Premo
RCC MAT PFA

DATE 7/2/90PAGE NO. 1SUBJECT TEST STAND MAINT.

- Notes for maint -
questions

Interview with
Jim Grounds

S-5114

- Major break downs? (most time concerning what components)
- how often (app)
- Sind 20% of failures that account for 80% of down time

main problems with test stands - shortage of operators

- Need more operators (time)
- Mods to test stands considered not too productive
- ~~the~~ # of operators critical path
- at one time there was a shortage of fixtures + tools
- straight eight hours not considered productive
- doing longer PM shutdowns because can do a better job with longer time and there are plenty of extra test stands
- rearrange PM schedules

DDB SECTION CODE 3:0DDB PAGE NO. 030005

ENGINEERING NOTES

EMPLOYEE PremoDATE 7/2/90PAGE NO. 2RCC MIAT PFASUBJECT TEST STANDS - Tim Grooms

- 20% of maint crew dedicated to software
 - need to promote and hire from outside ~~that~~
 - 10 year history of test ~~to~~ stand failures is used to determine which parts are ordered for spares?
 - there is a possibility ~~that~~ some stands are used more than others (favorites)
-
- Susan Randolph VAX PERSON
will ~~at~~ down load maint records
-

MR. Grooms appears to have a handle on the maint. problems and was very helpful

- need to talk with him more on the specifics of test stand breakdowns, repairs, and maint.

ENGINEERING NOTES

EMPLOYEE PremDATE 7/5/90PAGE NO. 1RCC MATPFASUBJECT TEST STAND # DOWN TIME

- Sorting of test stand historical data (GO II)

Ideas - ---

1. sort by length of down time (longest first to shortest)

1. This might indicate what problems take the longest to fix and might ~~also~~ show a shortage of parts inventory, tools, etc

2. sort by type of failure (problem)

by doing this type of sort it may be easier to locate the most ~~time consuming~~ common type of failure or problem and help to get a general idea of the ~~total time~~ ~~relative~~ relative distribution of down time by failure

3. sort by length of down time and use this data to develop a histogram of the frequency distribution ~~of~~ of down times:
(should use ranges instead of discrete values)



ENGINEERING NOTES

EMPLOYEE Premu

DATE 7/6/90

PAGE NO. 1

RCC MATPFA

SUBJECT TEST STANDS (GO II data)

Historical test stand data

model will require 1. mean time between failures (MTBF)
• (min, mode, max)

2. mean time to repair (MTR)
(min, mean, max)

1. (MTBF) - min, max are obtained directly from data.
- the mode should be ~~calculated from~~ approximated by a range determined from the examination of a histogram of the frequency distribution of down times

2. (MTR) - ~~obtained from~~
min, max obtain directly from data
- mean is obtained by ~~taking~~ average of all the data.

→ All MTBF, MTR, and failure numbers should be derived for each machine, each class of machines and all machines total?

No

- MTBF'S - times between failure are obtained by simply subtracting the time of a failure from the ~~the~~ following failure
(easy calc.)

ENGINEERING NOTES

EMPLOYEE PremoDATE 7/9/90PAGE NO. 1RCC MATPFASUBJECT TEST STAND REPAIR DATA
(GO 11)

Susan Randolph had completed a "first run" of the maint. records:

- min, max, median, and avg data was tabulated (by machine)
- poor data caused several problems
 - dates and times are at times inconsistent and/or missing
 - the calculated medians look suspicious
 - a lot of data was discarded (for example, down time for several of the ~~entries~~ entries was 0.0. This raises some questions as to the validity of the data)
 - comments ~~as to~~ describing repairs are inconsistent and could be more descriptive and accurate.
 - most of the problems could be corrected in the future with more careful data entry and format changes.
- A considerable amount of data editing is required to "clean" the data to a point where it can be used for calculating MTBF's and MTR's
- This will take a considerable amount of time and effort

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DDB PAGE NO. _____

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ENGINEERING NOTES

EMPLOYEE Premo
RCC MATPPADATE 7/9/90 PAGE NO. 2
SUBJECT _____

Earl Carter (VAX man) ^(Susan Randolph is on leave this week) ~~has to~~ will be working on the data (when he can find time)

- he supplied an example of the ~~data~~ ~~fee~~ repair record for ~~the~~ a machine on a $\$$ 5 1/4 inch IBM Shoggy disc.

- hopefully we will be able to work with the data on an IBM clone using Lotus 123, or a data base program

M. Henderson suggested that the data be returned to its source and cleaned up there.

- However, this would take at least 2-3 weeks.

we can't wait that long. We will have to come up with a good estimate for the INTR and INBF values from the data we have and then hope for better data to work with if more accuracy is required.

ENGINEERING NOTES

EMPLOYEE PremoDATE 7/11/90PAGE NO. 1RCC MAT PFASUBJECT INTERVIEW WITH JOHN REGISTER

- Hard toward conservation in keeping of parts
- don't have clear idea of salvage limits
- rely on test to see if serviceable
- precautionary removals many ^{to eliminate} any problems even if they only occur once especially F-16s same old controls

problem areas -

- tech data needed to determine if a part is good or bad (tech order)

- rely on experience to determine if a part is

- high part turnover because of conservation

- parts shortages - two year lead times

- ^{cause} procurement problems

- Bendix proprietary

- reverse engineering - measure

exchange items - bad part goes to warehouse for condemnations or expensive parts

ENGINEERING NOTES

EMPLOYEE PremuDATE 7/5/90PAGE NO. 1RCC MATPFASUBJECT TEST STAND # DOWN TIME

- Sorting of test stand historical data (GO II)

Ideas - - -

1. Sort by length of down time (longest first to shortest)

• this might indicate what problems take the longest to fix and might ~~also~~ show a shortage of parts inventory, tools, etc

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3. Sort by length of down time and use this data to develop a histogram of the frequency distribution of down times:
(should use ranges instead of discrete values)



ENGINEERING NOTES

EMPLOYEE PremoDATE 7/11/90PAGE NO. 3RCC MATPFASUBJECT JOHN REGISTER

OMTR'S - agreement

in house documents (process specs)
are a possible way to improve
process of repair - these can be
periodically updated when hard data
is refined from material review board

must be careful when writing spec's to
~~make sure~~ avoid excess time wasting

Need to control excess condemnations due to
the fact that it's ~~easy~~ easier to install
a new part than inspect an old one

- High turnover of tech support

~~WIP~~

Need full time manufacturing engineer

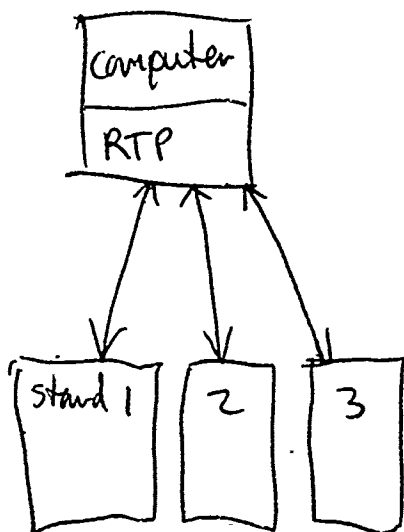
ENGINEERING NOTES

EMPLOYEE Premo
 RCC MATEPA

DATE 7/12/90 PAGE NO. 1
 SUBJECT TEST STANDS

INTERVIEW WITH Jim Grounds

Overview of test stand operation



- each system is usually made up of 1 computer and interface unit (called RTP), controlling 3 test stands

- there is usually at ~~least~~ least 1 5000Z test stand in each system.

- each test stand usually has at least one hydraulic pump
 - some stands have more than one pump. (2)

- the pumps are controlled by the computer and are connected to a common feed line

- as test conditions require, the computer turns pumps on and off in order to maintain the needed pressure in the system.

- the computer also helps ~~&~~ control excessive cycling of the pumps to prevent ~~over~~ overheating.
 (this is done by shutting down the pump, cutting power))

- The RTP serves as the A/D, D/A interface between the stand and the computer

ENGINEERING NOTES

EMPLOYEE

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DATE

7/12/90

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MATPPA

SUBJECT

TEST STANDS, Jim Grounds

- Computer program is broken down into 2 basic parts

1) part of the code is in machine language - This portion takes care of the basic functions of the computer, (ie data acquisition lower level functions). This part is generally hard to change without a lot of effort, and is configured specially for the hardware R/P.

2) * The rest of the code is higher level code (specialized) that can be changed and manipulated to configure the test stand. Test order and procedures, time rates and other functions related to. The test procedure can be changed by the maintenance programmers.

— One ^{type of} problem encountered is the inflexibility of the program to slight variations in the response rates of the various transducers and gauges that are used to monitor the test. This makes it very difficult to replace the transducers unless OEM parts are used. Often ~~these~~ these original parts are hard (and/or expensive to obtain).

— often a ~~transducer~~ replacement transducer is outside of a set response ~~range~~ window and throws off the test program timing. This problem

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also occurs ~~with~~ with parts such as stepper motors which may have variable response rates.

ENGINEERING NOTES

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RCC

MATPFA

SUBJECT

TEST STANDS - J. GROWDS

- There is also considerable system sensitivity to minor changes such as changing the length of hydraulic lines ~~and~~
- yet, there appears to be no real software system to routinely take care of these ~~in~~ changes without some trial and error.
- would an overhaul of the higher level program, with changes to calibrate in ~~the~~ and account for these changes in transducer response time be worth the effort???

- ~~One~~ ~~gen~~

- The instrumentation system

The instrumentation ~~is~~ for the test stands ~~is~~ is very complex. There are several components:

- digigages
- thermocouples
- pressure ~~transducers~~ transducers

- a major source of problems for the instrumentation is the digigages

- the digigages are essentially separate units from the computer system. They are especially complex and contain their own signal conditioning and data smoothing

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ENGINEERING NOTES

EMPLOYEE Premo
 RCC WATPPA

DATE 7/12/90 PAGE NO. 4
 SUBJECT TEST STANDS - JIM GROUNDS

- because the digi-gages ~~are~~ contain their own signal conditioning their response rates cannot be controlled by the computer
- any changes or replacements of the digi gages cause problems unless exact duplicates are installed. This causes a problem because modern replacement gauges typically have faster response rates (they usually have to be slowed down using a trial and error process by installing line restriction or other similar wds.)
- There has been an on going process of ~~at~~ & upgrading these digigages. They are currently working on the 3rd generation of changes for the gages.
- An ideal solution for the digigage problem would be to remove the gages and replace them with simple pressure transducers and then let the computer perform the data smoothing and control the response curves. However, Mr Grounds expressed doubt that this would be possible without major changes to the computer hardware (RTP). Because the hardware is custom designed at the time of manufacture, it is inflexible ~~in~~ in regards to changes in transducer configurations.
- in the above "ideal" solution pressure values would be presented on the CRT screen rather than the digigages

ENGINEERING NOTES

EMPLOYEE

Premo

DATE

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RCC MATPPA

SUBJECT

TST STANDS - JIM GROUNDS

- problems with the CRT screens are currently being worked on with a vendor

PUMPS AND PRESSURE REGULATION SYSTEM

- a major source of problems for the pressure system are regulator failures
 - a considerable amount of down time is related to pressure fluctuations or insufficient back pressure. Often the problem might be as simple as a clogged filter or can be as complex as a regulator failure requiring overhaul.
- a new air filtration^{system} is currently being installed in an attempt to reduce the failures (due to corrosion) in the regulators.
- because of the large amount of down time due to pressure regulation it might be worthwhile to investigate the effects of a more stringent PM program that would include ~~some~~ ^{regular} (possibly) some periodic overhaul of the regulators
 - ~~the failure data~~
 - more info about the specific failures in the regulators is needed before making any decisions about PM changes.

ENGINEERING NOTES

EMPLOYEE Premo
 RCC MA-PPA

DATE 7/12/90PAGE NO. 6SUBJECT TEST STANDS - Jim GroomsCURRENT UPGRADES

- At this time there are several upgrade projects which have either recently been completed or which will soon be completed
 - keyboard - vendor will supply duplicates of the original keyboards (no changes in design, simple replacement)
 - air filters - improved design ~~to~~ to try to reduce regulator problems
 - manifold gauges - plumbing change in order to make gauge changes quicker.
 - motor breaker change - new type installed to cause faster tripping in the event of motor failure ~~to~~ in order to prevent circuit damage's.
- resolver to digital receiver - this piece of instrumentation is placed in the line between the stand and computer. The new units are capable of faster operation than the old units, and therefore must be "throttled" to slow them down to ~~match~~ match the old units and prevent computer malfunctions.

ENGINEERING NOTES

EMPLOYEE Premo
RCC MATPPADATE 7/16/90 PAGE NO. 1
SUBJECT RE 7/12/90 conversation with
Jim Grands

- A common problem ~~is with~~ causing considerable down time and many test stand failures is burst discs.
- burst discs are not ~~necessarily~~ ^{necessarily} caused by a machine failure
- ~~the~~ the function of the discs is to act as a safety valve for the hydraulic system of the test stands. They are very similar in function to a safety fuse in an electric circuit. For example, if an outlet pressure (from a UFC) is too great, the disc will burst in order to protect the ~~in stream~~ test stand transducers and instrumentation. This is often caused by the defective UFC's, not ~~it~~ a defect in the test stand.
- So, ~~probably~~ when considering down time of a machine, most of the down time due to burst discs shouldn't be counted as a machine failure
- Mr. Grands mentioned that at times some operators would "double up" the discs in order to get a UFC to pass without causing a burst disc (a solution akin to putting a penny in a fuse box) although this doesn't occur any more.
- burst discs can be replaced by a machine operator which reduces downtime (maybe) but may lead (potentially)

DDB SECTION CODE 3.0DDB PAGE NO. 030020to ~~the~~ the type of situation mentioned above

ENGINEERING NOTES

EMPLOYEE

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RCC MATPPA

SUBJECT

Pro II DATA

- The machine historical record will be sorted by ~~Earl~~ Earl Center (on the VAX) using the following sort ~~the~~ criteria.

sort keys

	Primary	Second	Third
1	des-cost	ass-problem	ass-machine ID#
2	des-downtime	ass-problem	ass-machine ID#
3	ass-problem	ass-machine ID#	des-cost

des $\equiv$ descending ass - ascending

- hard copies will be made for each sort configuration
- configuration 1 will be used to find the portion of the problems which cause ~~the~~ most of the costs
- config 2 will be used to find the portion of problems which cause most of the down times
- config 3 will be used to identify the most common problems (occurrence)

DDR SECTION CODE 3.0

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030021

ENGINEERING NOTES

EMPLOYEE

Prema

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ROC

MATPPA

SUBJECT

GO II DATA, test stands

- Besides improvements already mentioned in previous notes, the following changes might make the GO II data more useful and help maint to do a better job

- 1) The problem section of the data needs to be standardized and more descriptive
- A logical way to do this would be to develop a list of potential repairs, each ~~cat~~ with its own code. For example, the test stand ~~could~~ be broken down into basic areas (computer, instrumentation, pressure regulation, pumps etc). Each basic area would then be broken down into sub categories to identify the specific part, each with a unique code or number. And finally there could be a code developed to identify the type of repair performed (replace, remove and repair, repair on machine, adjust, etc).
- By using a standard list, a craftsman ~~su~~ could quickly access the proper codes for his repair and this information could find its way into ~~into~~ the current data base (GO II)
- Fairly inexpensively, software could be developed to sort or identify problems with the ~~main~~ test stands on an ongoing basis.

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030022

ENGINEERING NOTES

EMPLOYEE

Premo

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RCC

MATPPA

SUBJECT

Go it data, test starts

- This information could be feed to ~~main~~ the proper supervisors in charge of repair and maintenance in a summarized format on a regular basis.
- This information could be used ~~to~~ to track trends in failures and would help in developing a good PM program.
 - problem areas and/or machines could be easily located ~~and~~ by the computer and corrective measures could be taken.
- If needed, ~~there would be a section~~ it would be possible for a craftsman to enter additional descriptive wording in addition to the codes. ~~As~~ The present system only allows descriptive wording and no coding. Variances in wording make this section of the repair record very difficult to use without spending huge amounts of time.
- ~~Following is a suggestion of coding (there are many possible coding methods)~~

ENGINEERING NOTES

EMPLOYEE

Premo

DATE

7/19/90

PAGE NO.

1/3

RCC

MATPFA

SUBJECT

TEST STANDS

DAVID J. BIPPERT

5-3665

Mr. Bippert gave a good general overview of the test stand maint. problems. Following is a summary of our meeting:

- PM is important to keeping the stands operating properly and Mr. Bippert was not opposed to ~~there~~ an ~~is~~ increase in PM. A "trade" of more PM (scheduled) for downtime sounds reasonable.
- Problems ~~are~~ with the test stand are difficult to diagnose because the UFC and the test stand are designed to work together. Because the stand and UFC ~~and~~ become "one w/ it" during a test, the exact cause of a problem is not easily isolated. Often this difficulty results in an operator moving a UFC to a different machine and this wastes a considerable amount of time.
- It ~~is~~ is hard to trouble shoot a test stand without a UFC on it without going through a formal calibration process.
- The testing process is almost fully automated. However it would be very difficult to develop a computer program to fully diagnose and/or check a test stand. This is primarily due to the need to have a UFC on the test stand (and fully connected) in order to

ENGINEERING NOTES

EMPLOYEE

Premo

DATE

7/19/90

PAGE NO.

2/3

RCC

MATPPA

SUBJECT

Test Stands - D. Bippert

Sully test it. There are some diagnostic programs available to test some of the functions of the test stand, but Mr. Bippert feels that these programs aren't believed or used by the operators very much.

- Bippert suggested a team of two experts, (one on the stand and one on UFC's) be used when there is a problem with a UFC on a test stand. In those cases, where the stand is suspect (not working properly) this team of experts would be called in ~~to~~ to brainstorm the cause of the problem and save time.
- Test stand operators have a tendency to disbelieve their test stand. For example, an operator may repeat a test many times in an attempt to sell a UFC, even though the automatic test program advises otherwise. The operator resists taking the UFC apart once he has it on the stand.
- Many of the adjusting screws ^(on the UFC's) are very sensitive and hard to adjust. In addition, it is very critical that the initial set-ins are done ~~at~~ correctly on the UFC before mating. If ~~the~~ the set-ins are incorrect, it becomes very difficult to correct the ~~the~~ mistake with ~~the~~ the external settings on the UFC. Perhaps more stringent specs on the initial set-ins would help prevent future problems with the UFC's during testing.

ENGINEERING NOTES

EMPLOYEE PremoDATE 7/19/90PAGE NO. 3/3RCC MATPFASUBJECT Test Stands - Bippert

One of the most common test stand failure problems is related to back pressure. Often back pressure will be out of limits (BPOOL)

There are 6 back pressure channels on each test stand

Most BPOOL problems are caused by dirty filters or contaminated needle valves

More frequent filter changes might ~~prevent~~ reduce downtime. RAR tests cause a large number of BPOOL problems and clogged filters on the stands which run a lot of those tests.

- TO's are inaccurate and are difficult to use if they are followed exactly in the testing process. They are difficult ~~to use~~ and time consuming to change. (years)

ENGINEERING NOTES

EMPLOYEE PremoDATE 7/20/90PAGE NO. 1RCC MATPPASUBJECT Test Stands - Jim Grounds

Most software for UFC testing has been debugged. Most tests are done in the automated mode. However, there is some operator discretion ~~at~~ as to how many tests should be rerun, given a failure. An operator can select any of 9 different tests.

There have been minor changes to the testing software for most tests, except for the SAT test which hasn't been messed with. The RAR (run as received) test hasn't been consistent (the procedure has been changed and the test implemented differently).

An artificial intelligence program had been developed to help the craftsman with the RAR test but it ~~hasn't~~ has not been utilized.

The bladder portions of the test stands are linked to pressure problems and might be a good candidate for increased PM attention.

- Similar to what David Bippert had mentioned in an earlier conversation with us, the test stand operators and supervision have ~~less~~ less confidence in the test stands than they might. Test stand calibrations are often "checked" using a "gold plated standard" (an accepted good UFC.) ~~that~~

ROY EVANS - PM guru

ENGINEERING NOTES

EMPLOYEE Andie McFarlandDATE 6-27

PAGE NO. _____

RCC: MATPFASUBJECT Equipmenttest stands log

The log book is kept to status the test stands. Entry is made every two hours.

Each area has a separate page but all are in the same book. A new book is started each month.

Question: what does yellow high light on ^{top} entry

Answer: trouble with test stand

Question: what does spud 667 mean

* Answer: _____

Question: ASI turn on

Answer: _____

ENGINEERING NOTES

EMPLOYEE L. M. FarlandDATE 6-28

PAGE NO. _____

RCC MAT PFASUBJECT 2upfront

The May 1990 is being input to a Excel spread sheet. (by our Kelly person). Each area will be put on a different spread sheet. The data can then be sorted many different ways to get information.

Question: can items be moved from a test stand in one area to a test stand in another area. or just moved between test stands (in case a test stand goes down or the required test stand is unavailable)

Answer: Yes - items can be moved -

GG - Gas Generator

RAR - Run as received

SAT - Service acceptable Test

MATRIX - ?

ASI - Auggie set in

MIL -

coming off/on - ready to to be placed on or to be taken off the test stand
plumbed - Units being connected to test stand.

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030029

ENGINEERING NOTES

EMPLOYEE

S. McFarland

DATE

6-29-1

PAGE NO.

RCC

MAT PFA

SUBJECT

Equipment
T/S

power outages, etc. cause data loss on test stands causing tests to be repeated.
• need more data / information

(overall)
repair operators do not work overtime
need augie set ins why not have 6-5 mech
work OT. to get the Augmentors ready to
be tested

Each test stand has its own program. As the tests are completed they are printed. When completed the operator stamps & initials each paragraph.

unit is placed on the T/S, plumbed in.
Then the computer runs the test sequence, giving instructions to operator, waits for response or an adjustment to be made. The operator can stop the test if a problem develops that can not be corrected without removing the item from the T/S

The 50002 test stands can perform required test on almost all units. (There are a few sub-sub-Assembly tests that require another test stand).

50005 test DB, Augie set in (computer mated to Augmentor. Adjustments are made then only fine tuning is done on Unitified testing.

DDB SECTION CODE

3.0

DDB PAGE NO.

030070

ENGINEERING NOTES

EMPLOYEE S. McFarlandDATE 6-29-2

PAGE NO. _____

RCC MAT PFASUBJECT Equipment / T/S

The 173 test sub-subassemblies. There are approximately 30^{possible} different assemblies, requiring about 45 min each.

Some sub-subassy must be replaced on unit it was removed from, others are interchangeable. Testing on pre flow items are as required.

Major components, ^(K-G) Gas Generator, Distribution body (DB), Computer can be mismatched - ie reassembled with subunits with different serial numbers. - note this is done very seldom - only 3 times in five years.

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030031

ENGINEERING NOTES

EMPLOYEE Harris

DATE _____

PAGE NO. 2

RCC _____

SUBJECT _____

50173 AND 50175 TEST STANDS

INTERVIEWS WERE CONDUCTED WITH 50173 AND 50175 OPERATORS REGARDING BASIC TEST STAND PROCEDURES, ESTIMATED TIMES, AND WORKLOAD OCCURRENCE FACTORS. THE TWO OBVIOUS TESTED PARTS ON THE 50173 ARE THE PLA BRACKET AND THE AUGMENTOR COMPUTER. THE SET-UP TIMES ARE TYPICALLY .75 HOURS WITH TEST TIMES AVERAGING APPROXIMATELY 4 TO 8 HOURS FOR THE PLA BRACKET AND AUGMENTOR. RESPECTIVELY, THE 50175 TEST STAND OPERATOR INDICATED THAT FOUR SPECIFIC TASK CODES ON TRACKER CONSISTED OF APPROXIMATELY 80% THE WORKLOAD (326, MANIFOLD FILL SERVICE; 322, PB ACTUATOR/LEAKAGE; 331, PLA BRACKET; AND 332, THE IGNITION WIRING HARNESS). SPECIFIC SET-UP AND TEST TIMES WERE GIVEN FOR EACH TASK AND WERE MERGED TO OBTAIN A WEIGHTED AVERAGE.

ONE ISSUE WHICH WILL BE EXAMINED DURING EXPERIMENTATION WILL BE WHAT EFFECT WILL OCCUR BY HAVING A LOWER WAGE-GRADE OPERATOR PERFORM THE SET-UP AND INSTALLATION FOR THE TEST ITEMS - (THIS ACTION ITEM WOULD APPLY NOT ONLY TO THE 50173 AND 50175 STANDS, BUT ALSO THE 50002, 50004, AND 50005 STANDS). BY ALLOWING HIGHER SKILLED PERSONNEL TO CONCENTRATE SPECIFICALLY ON TEST OPERATIONS, THE POSSIBILITY COULD EXIST TO OBTAIN HIGHER THROUGHPUT.

50004 STAND

THE 50004 TEST STAND IS DEDICATED SPECIFICALLY FOR GAS GENERATORS. 28 TEST POINTS ARE REQUIRED FOR A COMPLETE TEST RUN ON A 6A GENERATOR, AND A SMALL RUN ON A 6G REQUIRES ONLY 5-6 TEST POINTS. THE MOST SIGNIFICANT PROBLEM NOTED FOR TESTING IS THE SPEED RECEIVER CALIBRATION. ANOTHER ISSUE CONCERNS OPERATOR TRAINING AND SKILL. OPERATORS VARY IN TERMS OF WHAT TECHNIQUES THEY KNOW CONCERNING OPERATION OF THE STAND. THIS SITUATION CAN OBVIOUSLY AFFECT VARIABILITY OF OPERATION TIME AND TO AN EXTENT QUALITY OF THE WORK PERFORMED. AN EFFORT TO STANDARDIZE THE OPERATION GIVEN "OPTIMAL" TECHNIQUES DEVELOPED BY OPERATORS MIGHT ENHANCE THE PROCESS FLOW.

DDB SECTION CODE

#3

DDB PAGE NO. _____

030052

ENGINEERING NOTES

EMPLOYEE Harris
RCC _____DATE _____
SUBJECT _____PAGE NO. 350002 STAND

THE 50002 STAND IS THE MOST SIMPLE STAND IN THE UFC PROCESS, ANY TEST REQUIRED FOR THE UFC CAN BE ACCOMPLISHED EXCEPT FOR GAS GENERATOR TESTING. A "TYPICAL" RUN AS RECEIVED (RAR) CAN REQUIRE APPROXIMATELY 51 STEPS WHILE AN AUTOMATOR SET-IN (ASI) REQUIRES 49 STEPS. 33 TEST STANDS ARE 50002 AND ARE LOCATED IN AREAS B AND D.

A BIG PROBLEM INDICATED BY TIB OPERATORS CONCERNS THE DIGITAL GAUGES. MORE PROBLEMS OCCUR FREQUENTLY WITH THE GAUGES THAN ANY OTHER ITEM. SEVERAL STANDS CAN BE CONNECTED TO ONE PUMP, WITH THE RESULT THAT THE ENTIRE COULD FAIL IF A PROBLEM DEVELOPS WITH ONE OF THE STANDS. IT IS UNCERTAIN WHETHER THE MODEL WILL BE AFFECTED BY THIS CONSTRAINT.

ALTHOUGH THE 50002 IS CAPABLE OF PERFORMING MANY DIFFERENT TESTS, PRELIMINARY OBSERVATIONS CONCERNING OPTIMAL USE OF THE STANDS IS SOMEWHAT UNCLEAR. MODEL RINS SHOULD DETERMINE IF THE 50002 SHOULD BE USED SPECIFICALLY FOR END-OF-PROCESS TESTS.

GAS GENERATOR

OF THE 56 TASKS ASSIGNED FOR THE GAS GENERATOR WORK, APPROXIMATELY 11 OPERATIONS DETERMINE THE 80% WORKLOAD FOR THE SECTION. THE PRIMARY OPERATIONS ARE REMOVING AND INSTALLING COMPUTERS AND LINES, WORKING LOADS, LEVERS, INDEXING, SHIMMING AND SAFETY WIRES, AND GOVERNOR CAM SHAFT. A DISCRETE DISTRIBUTION WAS ASSIGNED TO THESE DETERMINED SETS OF OPERATIONS FOR THE OVERALL GAS GENERATOR REPAIR.

ONE OF THE PROBLEMS ENCOUNTERED IN THE UNIT CONCERNS INSTRUCTION MISUNDERSTANDING AS TO WHAT THE PROBLEM ACTUALLY IS WITH THE GAS GENERATOR. IN ORDER TO CORRECT THIS SITUATION, A FEW CROSS-TRAINED TEST STAND AND 66 MECHANICS WORK ON DIFFICULT DETERMINATIONS AND HELP FACILITATE THE PROBLEM. THE METHOD HAS ENJOYED SOME SUCCESS.

DDB SECTION CODE #3

DDB PAGE NO. _____

030033

ENGINEERING NOTES

EMPLOYEE GARDNER

DATE _____

PAGE NO. 1RCC MATPFASUBJECT Test Stand Down time

Off site maintenance reports the availability of UFC test stands as very high (over 98% across the past year). Our analysis of maintenance data records (G011) confirms this high average availability but also shows some additional considerations.

The test stands show a very high rate of unscheduled failure. The maintenance down time for these failures is very small however, so the average availability figure is quite high. An examination of the labor & mat'l costs per maintenance action show that less than 5% of the jobs incur a mat'l cost. This figure is probably skewed by bench stocks of common-failure items (Burst disks or filters/ small fittings & seals) which are not ordered on a per-job basis. It is also possibly corrupt if parts are not always ordered against the job that requires them (this can happen if there is more than one maintenance job open). ~~My~~ My expectation, however, is that most of these maintenance jobs are for adjustments only. These stands are "Twitchy" and require frequent adjustment to stay within specs. The single greatest offender appears to be "Back Pressure out of Limits" followed by burst disks. The Back pressure problem can have a variety of causes - we are still trying to identify any trends there. Sean Crosby (our fuel systems test stand engineer) suspects that the burst disks are routinely operating too near their burst point. This causes degradation of the disk and may be causing an unnecessarily high rate of failure. Sean is trying to locate another disk that will be more robust. He is also looking into the possibility of ~~a~~ a bypass valve that could be reset

DDB SECTION CODE 310

DDB PAGE NO. _____

030034

EMPLOYEE GARDNER

DATE _____

PAGE NO. 2RCC MAT PFASUBJECT Test stand downtime

by the T/S operators.

Examination of T/S log books and interviews with production indicate that the impact on ^{UFC} production flowtimes ~~are~~ of unscheduled downtime is substantially greater than just the actual test stand down time. When a stand goes down, the UFC production people are frequently required to de-plumb & remove the UFC under test and re-install it later, after the stand is repaired. They must then restart the test at the beginning (if the stand was malfunctioning, the test results are invalid), losing all time invested to date. There is also a tendency (given the shortage of T/S operators) for a ~~T/S~~ ^{UFC} to "lose" its operator for other duties. This means the UFC sits for at least one shift. This increases the flowtime & WIP levels in the RCC.

While we have not completed a statistical analysis of the log book data, I suspect that an unscheduled T/S failure generates a production delay of 3-8 hours on the average. We plan to model this by using the production downtime as a mean time to repair (MTR) figure for the test stands rather than the MTR generated using off-site maintenance data. This should provide a more realistic evaluation of equipment-generated delays in the UFC process.

One area of potential improvement appears to be in scheduled preventive maintenance. There is currently ~~a~~ ~~an~~ fairly extensive PM schedule on the test stands by Jim Grounds tells me that only

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030035

ENGINEERING NOTES

EMPLOYEE GARDNER

DATE _____

PAGE NO. 3RCC MATPFASUBJECT Test Stand down time

the 180 calibration/PM is actually performed.
~~the~~ An analysis of the # of maintenance calls for a 180 day period (a year's worth of data, normalized to reflect the fact that each 5002 T/S is calibrated ~~at~~ at a different time) shows that unscheduled maint. calls increase by about 20% across the 180 day period. If off-site could perform more frequent PM the could reduce average # unscheduled maint. calls by about 20%. This would mean production would experience fewer delays but would have to schedule more downtime for PM.

We are currently trying to develop a recommended PM schedule to accomplish this.

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030036

ENGINEERING NOTES

EMPLOYEE GARDNERDATE 26 July 90PAGE NO. 1RCC MTRFITSUBJECT Preventive Maint. of UFC Test Stands

Interview Mr Roy Evans (MAIA) and Dave Clark (Hamilton STANDARD) regarding Preventive Maintenance (PM) on the UFC test stands. Mr Evans concurs that a more aggressive PM schedule would reduce the instance of unscheduled downtime on the stands. He has already made considerable progress in this area himself. By increasing the scope of the current PM/scheduled maintenance operation and instituting a twice-weekly fluid level check, he estimates that his team has reduced the average unscheduled failure rate by 4.5 failures per day. This is a significant improvement and indicates to me that a Reliability Centered Maintenance (RCM) program would produce even better results. Will recommend as Quick Fix

Mr Evans' team is allocated 32 positions for WG-12 electronic Repair Technicians, but he is only able to fill 7. These ~~is~~ 7 skilled technicians are augmented by WG-5 helpers and some loan ins from other areas. The large percentage of semi/un-skilled technicians puts substantial strain on Mr Evans' ability to perform unscheduled maintenance. Only the skilled workers can troubleshoot ~~and~~ diagnose & repair failures on the test equipment, but each skilled worker can supervise the work of several helpers performing scheduled PM. Mr Evans has structured his workforce schedules to take advantage of this - using WG-5s to top-off fluid levels for example. This situation means that unscheduled maint. (failures) have a significant impact on his efficiency. He estimates that every hour of unscheduled downtime on a stand costs him 2-3 skilled man hours. Failures are a serious headache for him but PM is relatively easy to ~~even~~ handle.

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030037

ENGINEERING NOTES

EMPLOYEE GARDNERDATE 26 July 90PAGE NO. 2RCC MAT/FASUBJECT PM on UFC Test Stands

Mr Evans also credited ~~the~~ the fact that his group was working a stricter PM schedule with helping relieve the parts problems experienced in the past. By inspecting parts more often/regularly, they have been generating a steadier demand on the supply system and have been able to better predict future spares requirements. He has also forbidden his technicians to swap parts between stands. He feels that the spare/replacement part situation is better now than at any time in the past. This is significant, as the test stands are already several years past their originally-planned life span and are scheduled for retention through the year 2005. RCM or a similar PM plan will be vital if these stands are expected to continue to support production.

Mr Evans pointed out that many of the failures are caused by foreign matter in the fluid. This situation frequently produces Back Pressure out of Limits problems (13.7% of all failures) ~~and~~ or Burst disks (7% of all failures). The primary source of this foreign matter is the UFC under test. He recommended that each UFC be flushed out before ~~the~~ testing. The most critical contributor to this situation was UFCs undergoing Run As Received (RAR) tests prior to repair. This test is at the beginning of the UFC OCM repair process and involves running the UFC at its incoming condition - normally full of crud from the field.

ENGINEERING NOTES

EMPLOYEE GardnerDATE 26 July 90 PAGE NO. 3RCC MATPFISUBJECT PM on UFLC Test Stands

Those stands used most frequently for RARs show a higher instance of fluid/pressure related failures than the average. These stands should receive more frequent PM than others. I asked Mr Evans what would be the effect of dedicating certain stands to RAR only. He indicated that failure rates on the RAR stands would substantially increase while failure rates on the other stands would decrease proportionately. The RAR stands could then be scheduled for heavier PM and total failures reduced significantly.

This would be an excellent idea if it could be made to work. The RAR is at the beginning of the process and does not need significant excess capacity to maintain production (per "The Goal"). The RAR is also not a calibration-critical test so calibration requirements would be less stringent for the RAR test stands. The SAT test, on the other hand, is at the end of the process, so it needs more spare capacity than any other operation & it represents final sell-off standards so it needs the tightest calibration available. This looks like a great potential QF but needs to be run on the model.

Could the RAR stands be fitted w/a pre-stand filter?

Mr Evans feels that 99% of all L disks are caused by operator error. He thinks the operators need more/better training. Will Ask Dr Majors to look into this.

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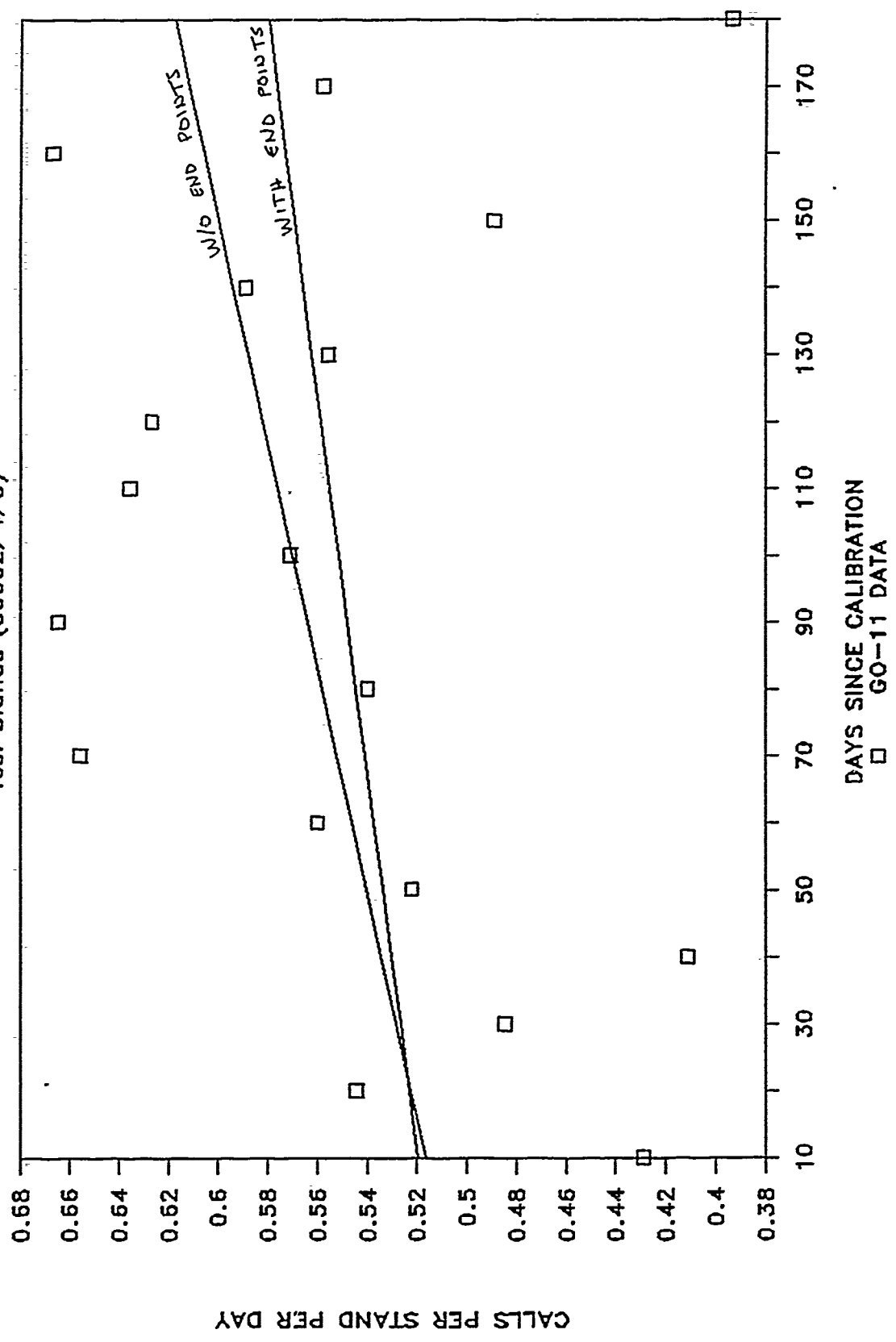
DDB PAGE NO. _____

030039

030000

MAINT. CALLS OVER 180 DAY CAL. CYCLE

Test Stands (50002/4/5)



11

x-axis
↓

data points
↓

line
↓

	Days	Calls/dy	c-fit	c-fit w/o end pts.
I	10	0.429	0.520	0.517
II	20	0.544	0.523	0.523
21	30	0.484	0.527	0.528
	40	0.411	0.530	0.534
etc	50	0.522	0.534	0.540
	60	0.560	0.537	0.546
	70	0.656	0.541	0.552
	80	0.540	0.544	0.558
	90	0.664	0.548	0.564
	100	0.571	0.552	0.570
	110	0.636	0.555	0.576
	120	0.627	0.559	0.582
	130	0.556	0.562	0.588
	140	0.589	0.566	0.594
	150	0.489	0.569	0.600
	160	0.667	0.573	0.606
	170	0.558	0.576	0.612
	180	0.393	0.580	0.618

Regression Output:

Constant	0.510611
Std Err of Y Est	0.068001
R Squared	0.156533 0.395643
No. of Observations	16
Degrees of Freedom	14

without end points

X Coefficient(s)	0.000594
Std Err of Coef.	0.000368

Regression Output:

Constant	0.516049
Std Err of Y Est	0.084607
R Squared	0.050551 0.224836
No. of Observations	18
Degrees of Freedom	16

with end points

X Coefficient(s)	0.000354
Std Err of Coef.	0.000384

Note: this is average data for 45 test stands and is derived from GO-11 data. Type S00002/4/5 test stands are included. Stand #'s 4458, 4484, 4485, and 4486 are not included due to bad data.

030041

EMPLOYEE Parker DATE 26 June 70 PAGE NO. _____
RCC INAT/FIT SUBJECT Equipment Maint.

Tuesday - 6/26/90

Ms. Henderson and I went to meet with Jim Grounds and Roy Evans today. We discussed some of the equipment maintenance problems, both past and present, which Mr. Grounds has experienced. One of the most significant problems he faced when he first entered this area was the fact that his predecessors did not schedule down time for test stands undergoing preventive maintenance (PM). Since most of the UFC testing equipment is placed in systems of two or more interlinked machines, this meant that test equipment in several systems could be down at any one time. This is naturally unacceptable due to the impact on UFC production. Mr. Grounds has since scheduled the preventive maintenance such that only one system will be down at any one time. I was able to obtain the preventive maintenance data for the various systems, which is basically every 180 days for a duration of 40 hours, performed exclusively on first shift, Monday through Friday. Most of the work performed during this maintenance is calibration, although some inspection and cleaning is also performed. The attachments following this page are the identifiers for the test equipment, as well as the systems in which they reside, and their individual PM data. The attachments are designated by the letter "B".

As we were unable to meet with Roy Evans, we went to see Mr. Manzetti, with whom Ms. Henderson wished to speak in relation to obtaining the printouts for determining down time by machine as well as mean time between failures (MTTR). Mr. Manzetti was on leave, but we left a list of the information we wished collected with Chris Borac, who works for Mr. Manzetti. I will pick up this data tomorrow.

DDB SECTION CODE 3.0 DDB PAGE NO. _____

030042

ACFCM (2) MATPFA (2) MAW (1) DIRECT LABOR SUMMARY REPORT

DATE 06-18-90 A-G037G-FD2-D2-BF 173

SA-ALC

RCC: MATPFA

DUTY CODE	SPEC	INDIRECT	FACTOR	ACTUAL	CURRENT DAY	ACTUAL	HOLIDAY	REGULAR	MONTH TO DATE	ACTUAL	HOURS	EARNED	HOURS
CODE	PROJ	BUDGET	ACTUAL	REGULAR	OVERTIME	REGULAR	OVERTIME	OVERTIME	OVERTIME	OVERTIME	OVERTIME	OVERTIME	OVERTIME
11	DA			270.0		270.0		3629.0	708.2		8.0	5562.5	125.8
11	HB			883.0	12.0	883.0		7399.0	2388.5		15180.5	15180.5	156.5
11	HF			1153.0		1153.0		11028.0			20751.0	20751.0	148.9
DUTY CODE TOTALS													
CLASS SUB TOTALS													
DIRECT TOTALS													
21		10.9	11.8					11028.0	3088.5		20751.0	20751.0	148.9
22		1.4	1.4					11028.0	3088.5		20751.0	20751.0	148.9
23		1.8	1.8					11028.0	3088.5		20751.0	20751.0	148.9
24		2.6	2.6					11028.0	3088.5		20751.0	20751.0	148.9
25		12.1	12.1					11028.0	3088.5		20751.0	20751.0	148.9
INDIRECT TOTALS													
31		10.4	12.1					1708.5			2150.1	2150.1	126.8
32		3.6	3.6					505.5			747.0	747.0	120.0
33		0.5	0.5					520.0			103.8	103.8	120.0
CIV LEAVE TOTALS								2731.0			3008.9	3008.9	110.2
RCC LEAVE TOTALS								2731.0			3008.9	3008.9	110.2
RCC TOTALS								18216.0	3315.7		21531.7	21531.7	130.1
MEMO ENTRIES													
39													
SPECIAL PROJECTS													
41								602.0			602.0	602.0	110.2
42								272.0			272.0	272.0	110.2
43								498.0			498.0	498.0	110.2
44								24.0			24.0	24.0	110.2
45								88.0			88.0	88.0	110.2
46								88.0			88.0	88.0	110.2
47								88.0			88.0	88.0	110.2
48								88.0			88.0	88.0	110.2

Notes - report not for review
This report is for review
Hours not correct
of hours

(5/12) - 692 - 9600

Km 1232

030043

Attachment A

ENGINEERING NOTES

EMPLOYEE P. Parker DATE 6 PAGE NO. 2
RCC MATPFA SUBJECT Equipment

Wednesday - 6/27/90

I went with Ms. Henderson to meet with Roy Evans, who is the supervisor and dispatcher for the test stand maintenance crews. Mr. Evans talked to us in relation to how test stand problems are reported and work crews are dispatched. Apparently, the problems are called into his shop, where they are entered into a log book along with the time that the call is received. Work crews are then dispatched to the UFC testing areas. I was impressed that the crews are dispatched almost immediately. Both Mr. Grounds and Mr. Evans appear very serious about their stated belief that the UFC area is their customer, and customer satisfaction comes first. This is important to us, as it will help in determining the actual down time of the equipment. This will be further aided by the fact that the UFC test stand operator must sign off on the work order upon completion of the maintenance. The only piece of data not covered in the maintenance log book is the amount of time from when the test stand went down to when it was called in. While we would assume this to be a fairly small period of time, we can check on the actual failures by referring to the test stand log books, which are kept by the operators.

We went to Manzetti's area and picked up the printouts on MTTR and MTBF. While configuring the data represented in these reports to our specific needs will be labor intensive, I feel more confident about the data integrity now that I know how the checks and balances on the collection and reporting system work.

DDB SECTION CODE 3.0

DDB PAGE NO. _____

030044

ENGINEERING NOTES

143

EMPLOYEE GardnerDATE 25 Sept 90PAGE NO. 1RCC MATPEASUBJECT Equipment Maint. History

The following sheets show the # of unscheduled maintenance calls (from the Gp 11) for Each test stand from 1 July 89 - 1 July 90. The breakdown is as follows:

<u>Stand #</u>	<u>Stand Type</u>
44 XX	50002
45 XX	50004
43 XX	50005

No obvious statistical trends or patterns. Variation in # of calls per stand (by type) varies by usage, ie: 11 stands are currently down for a blown bus bar.

DDB SECTION CODE _____

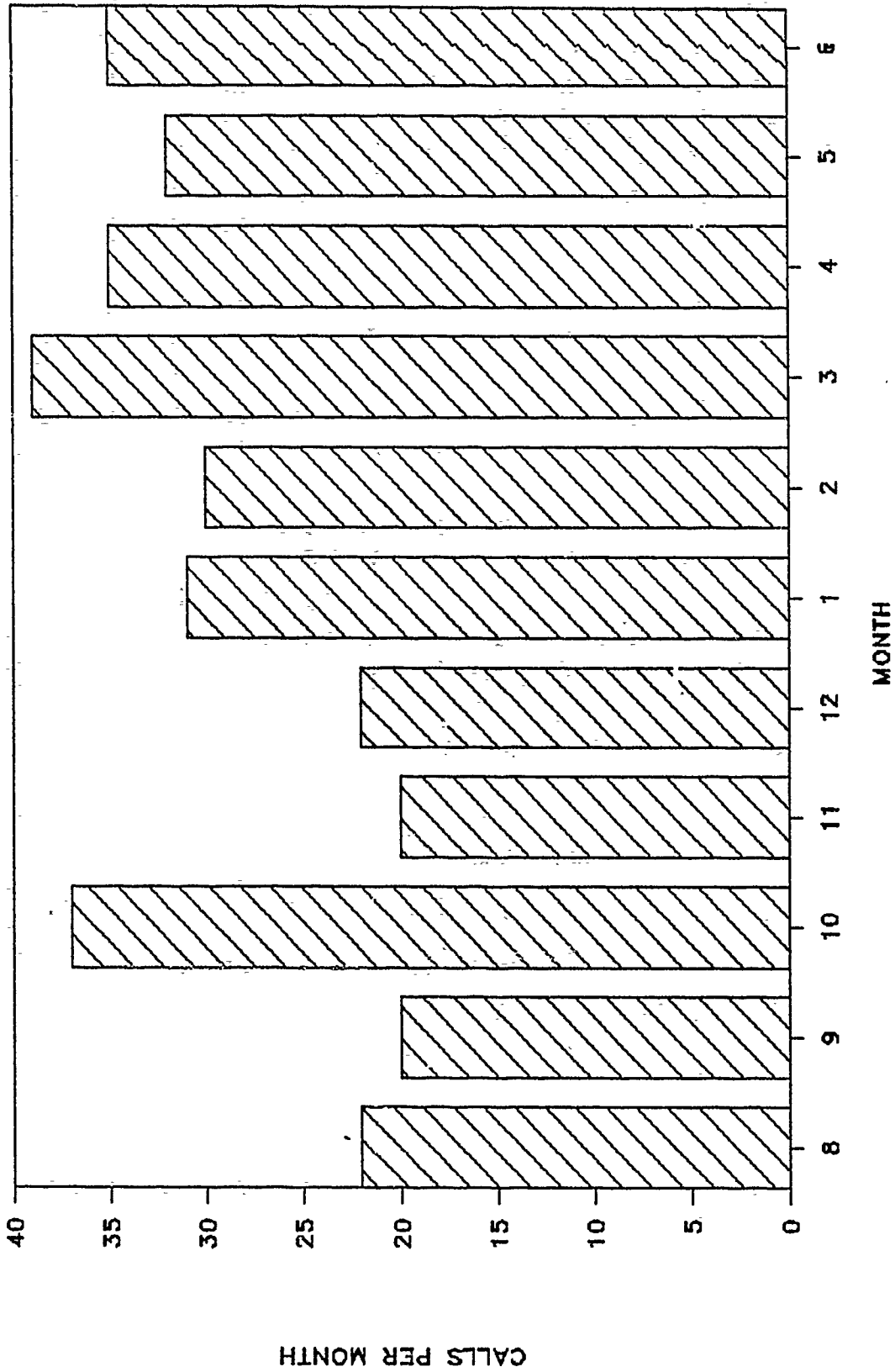
DDB PAGE NO. _____

030045

970000

MAINT. CALLS (1989/90)

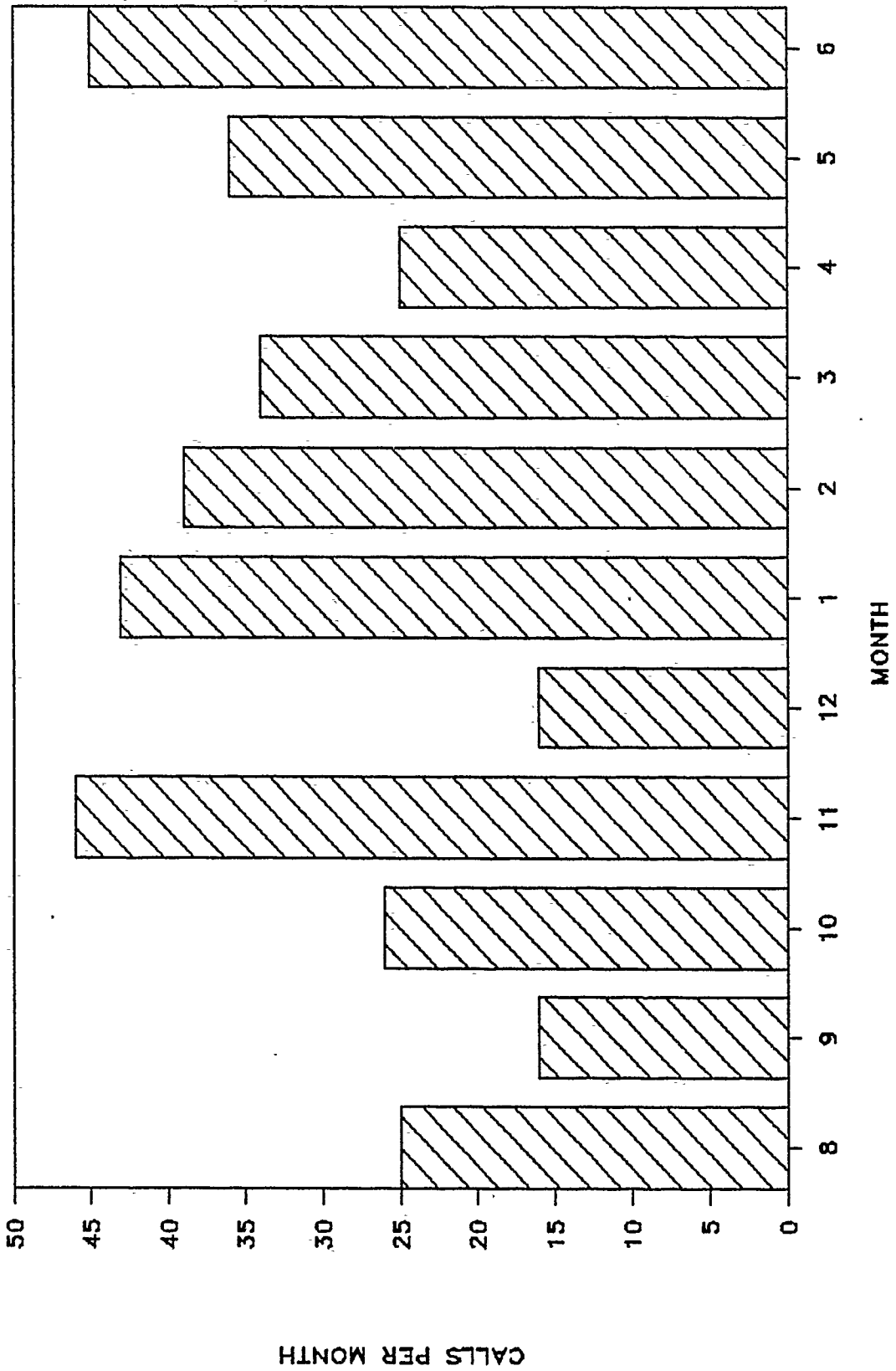
4459



270000

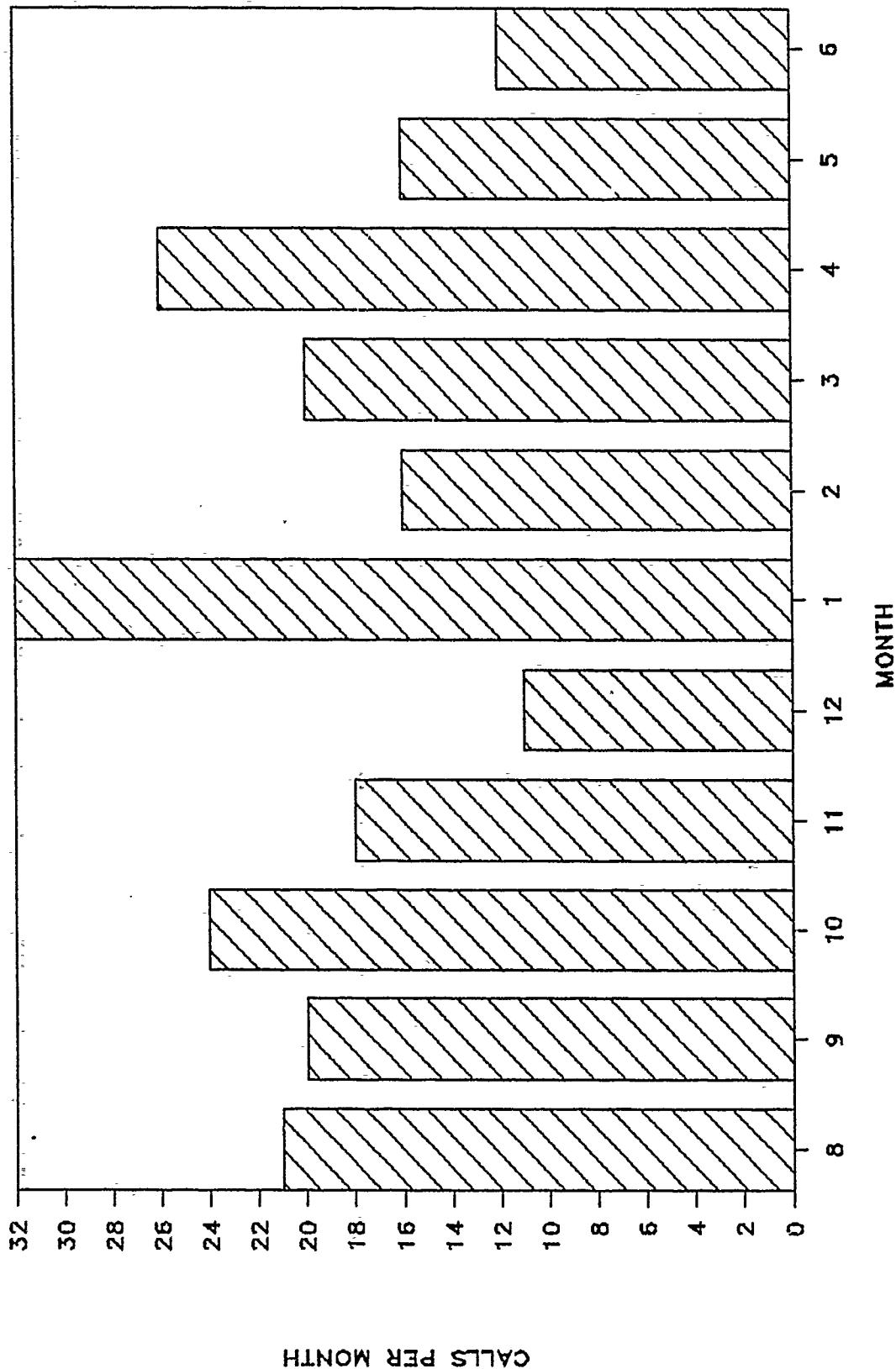
MAINT. CALLS (1989/90)

4460



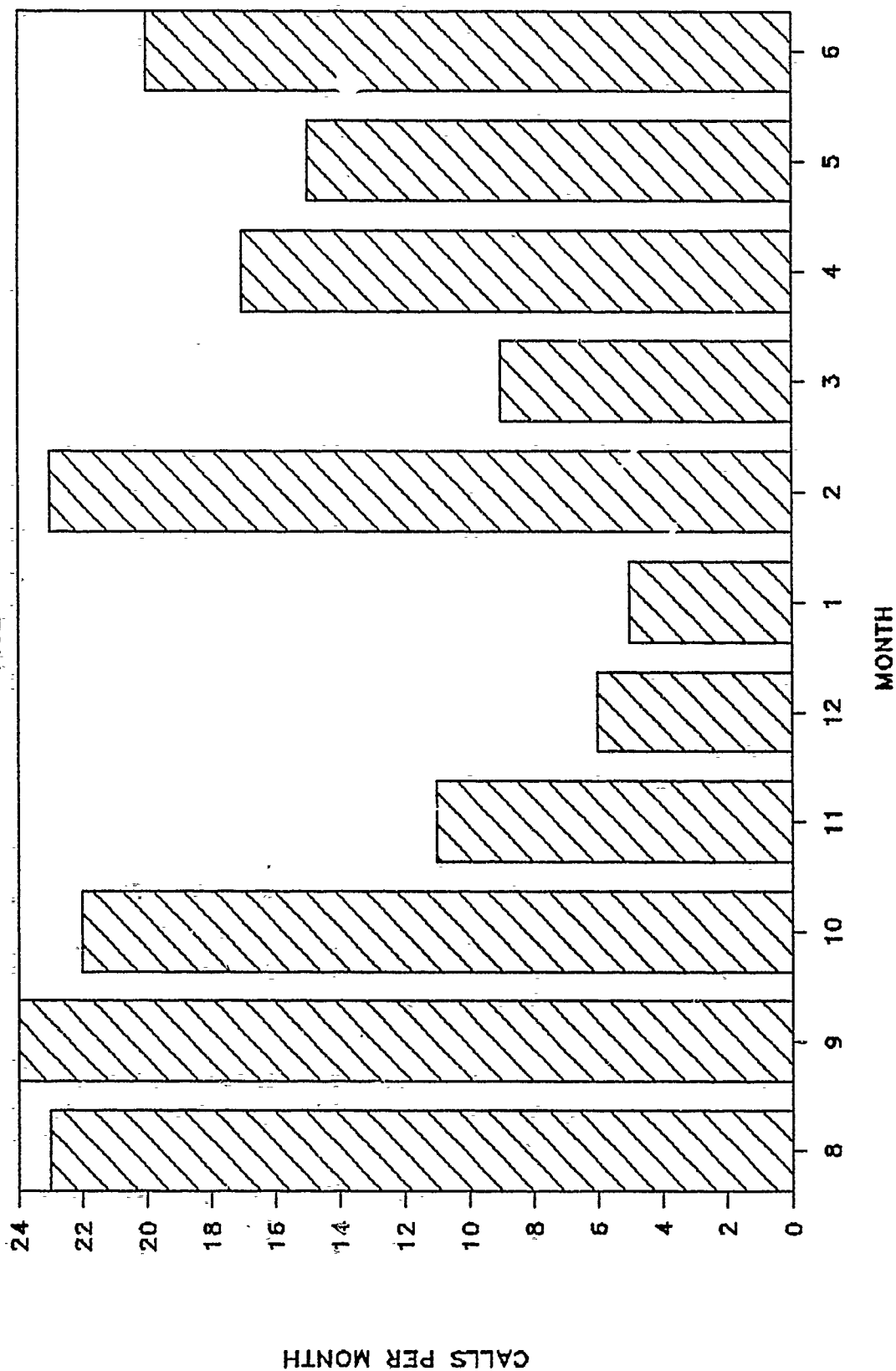
MAINT. CALLS (1989/90)

4461

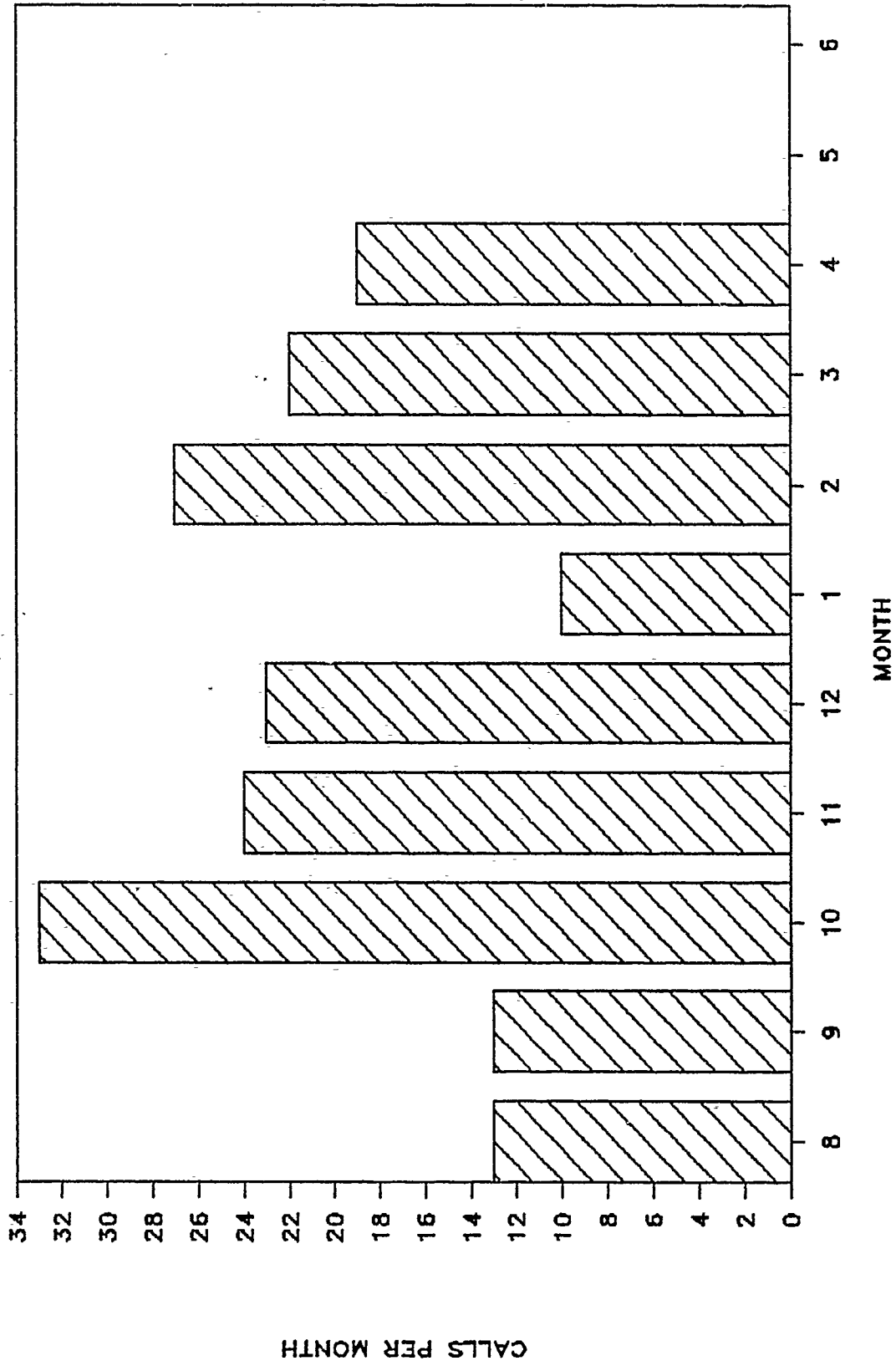


MAINT. CALLS (1989/90)

4462

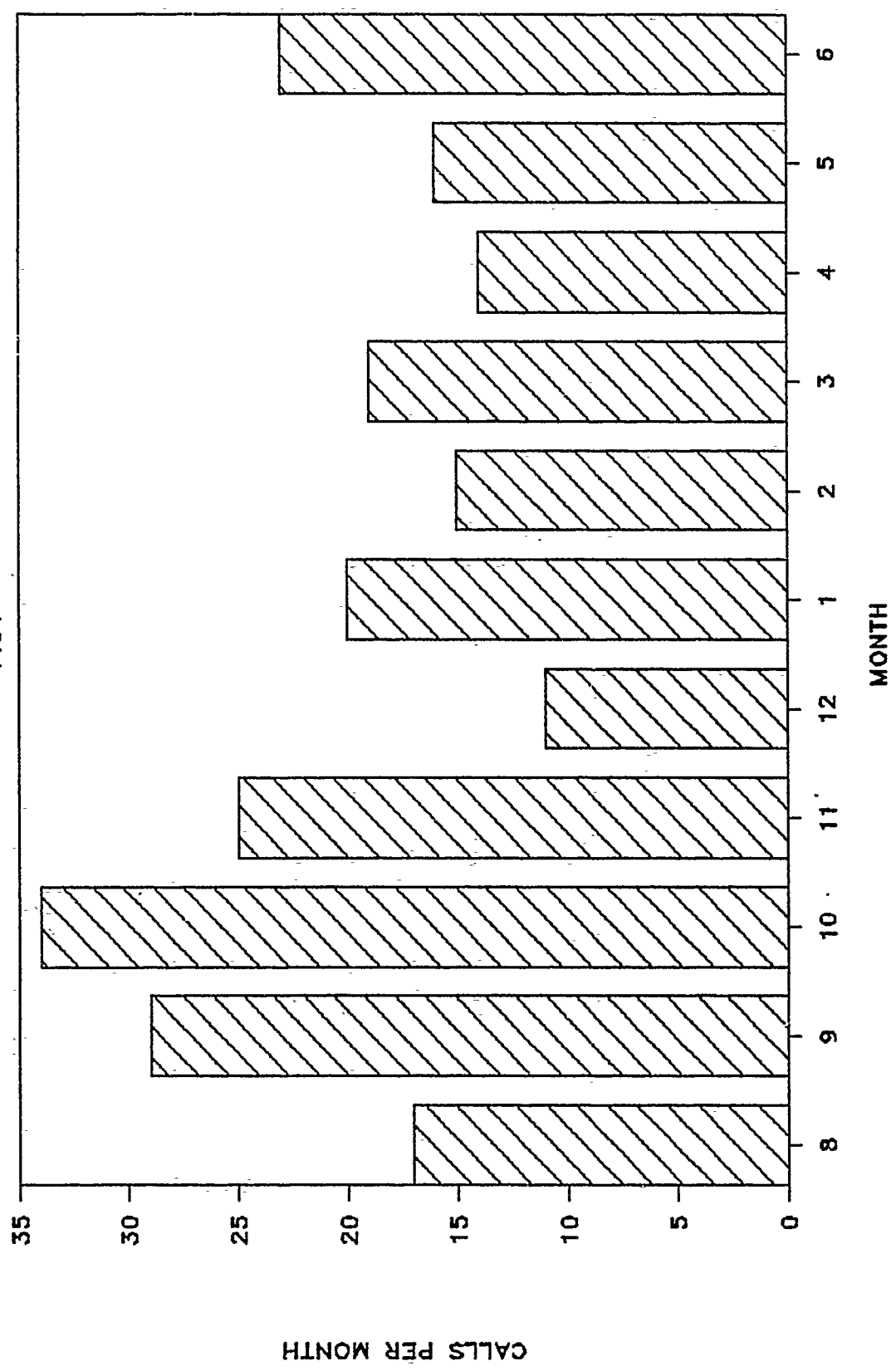


MAINT. CALLS (1989/90)
4463



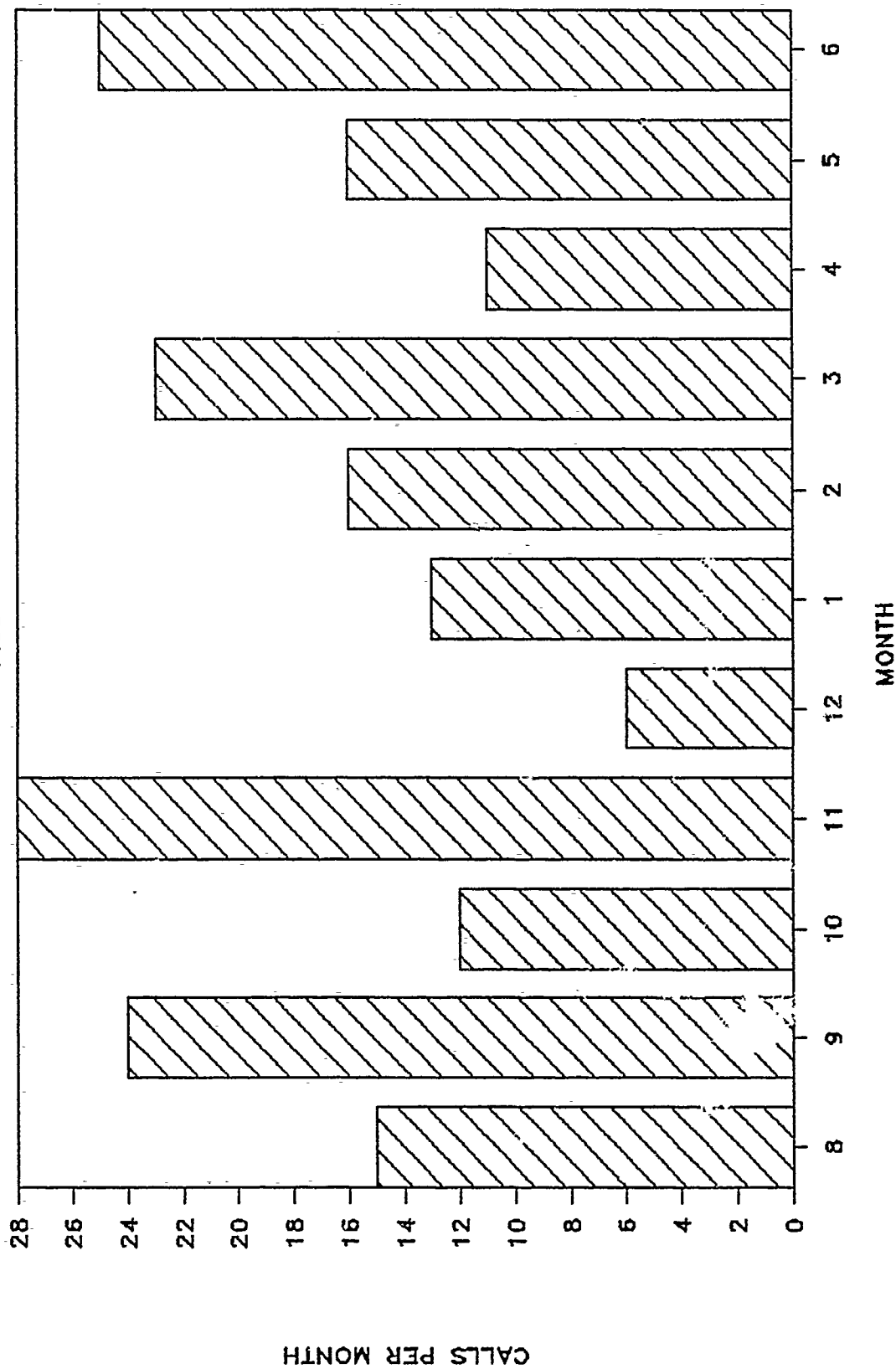
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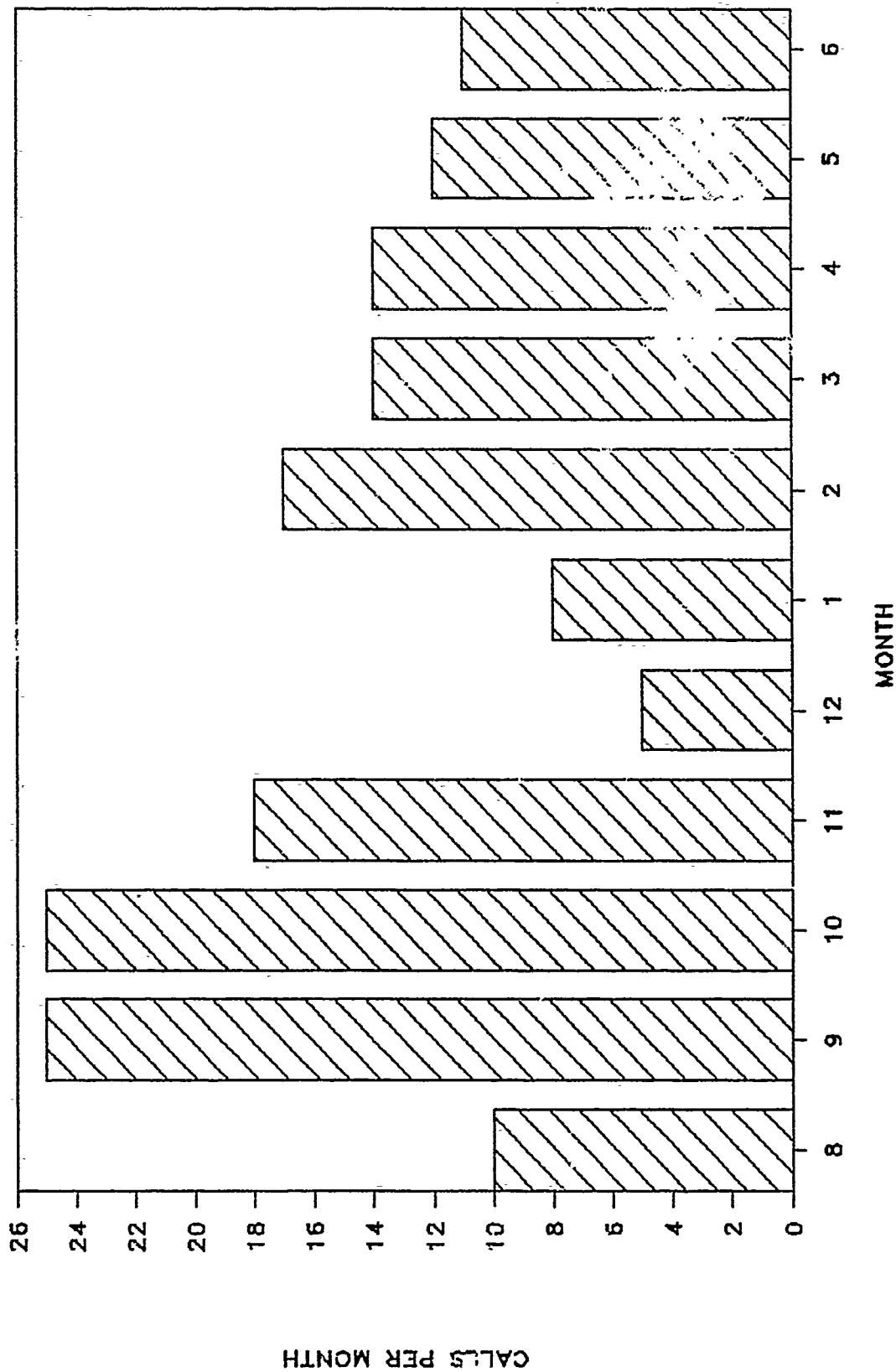
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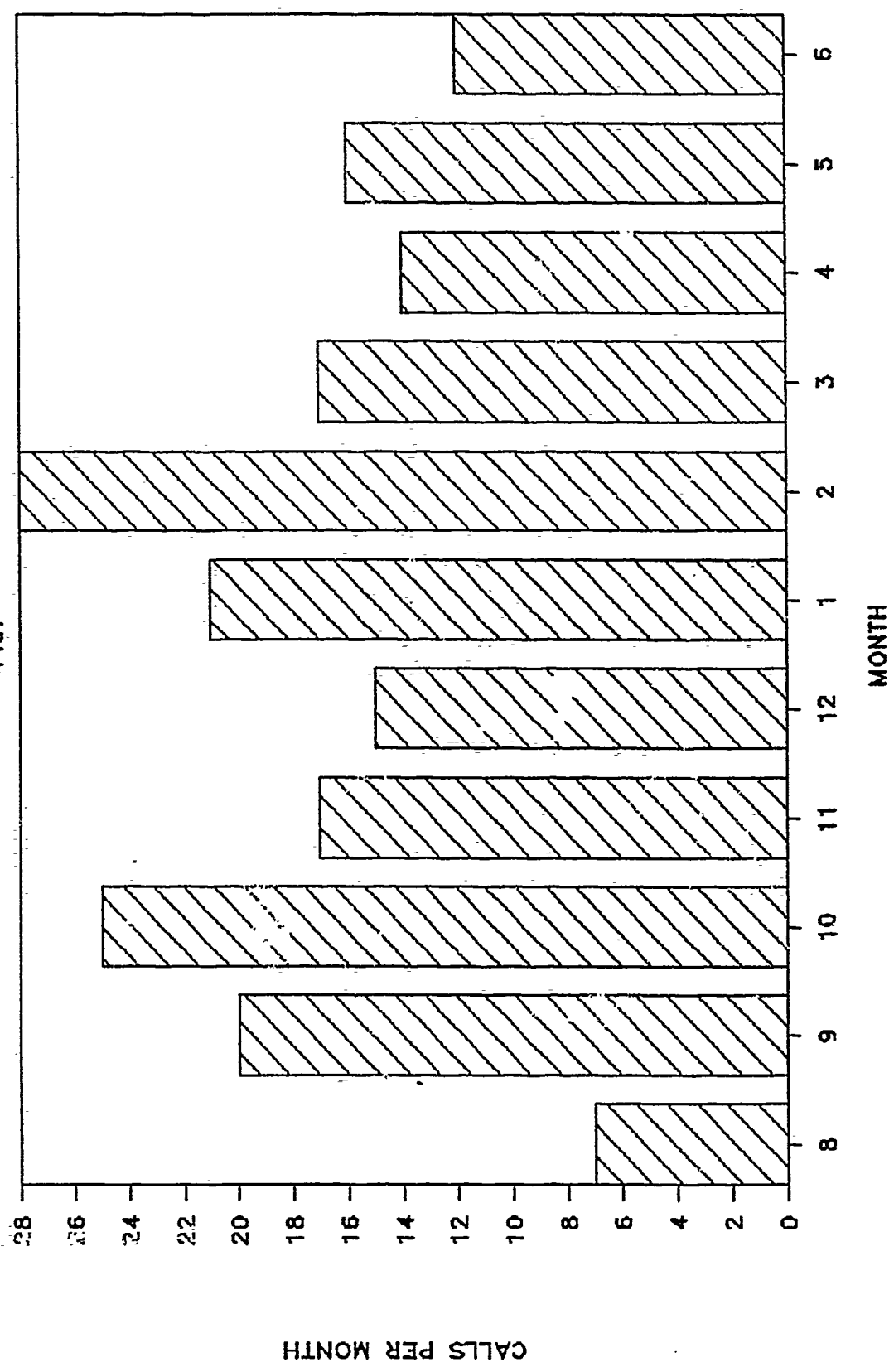
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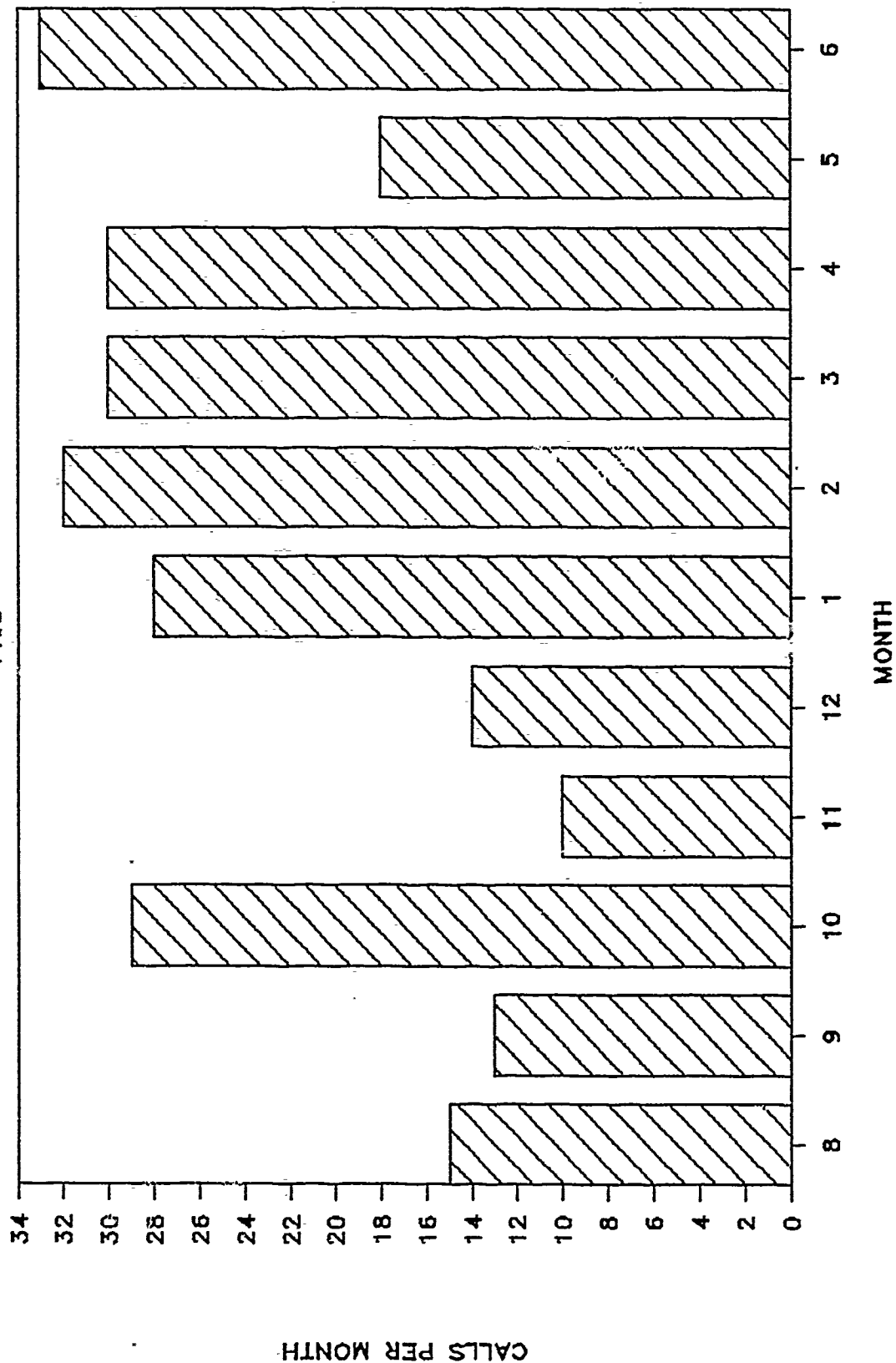
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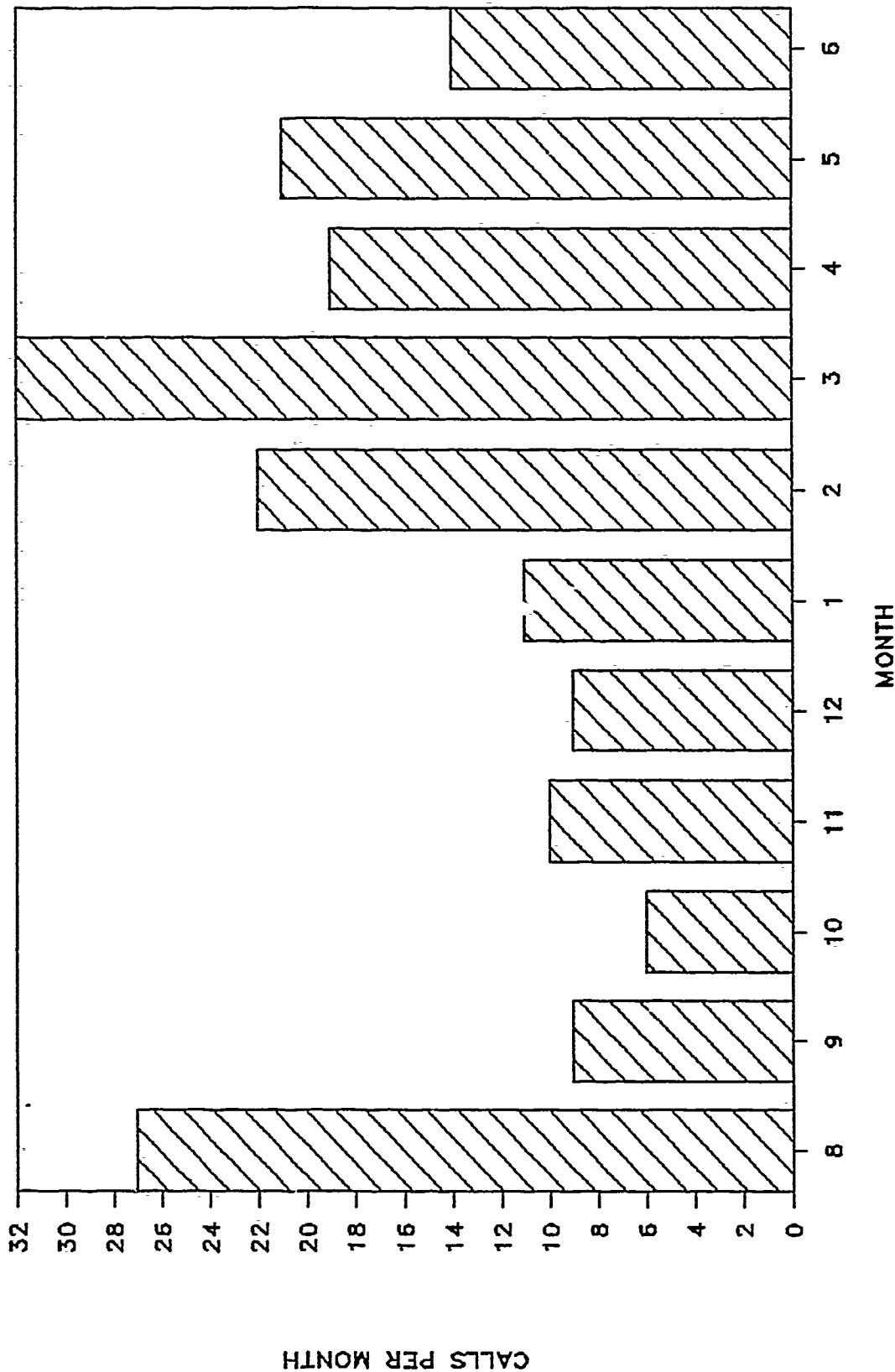
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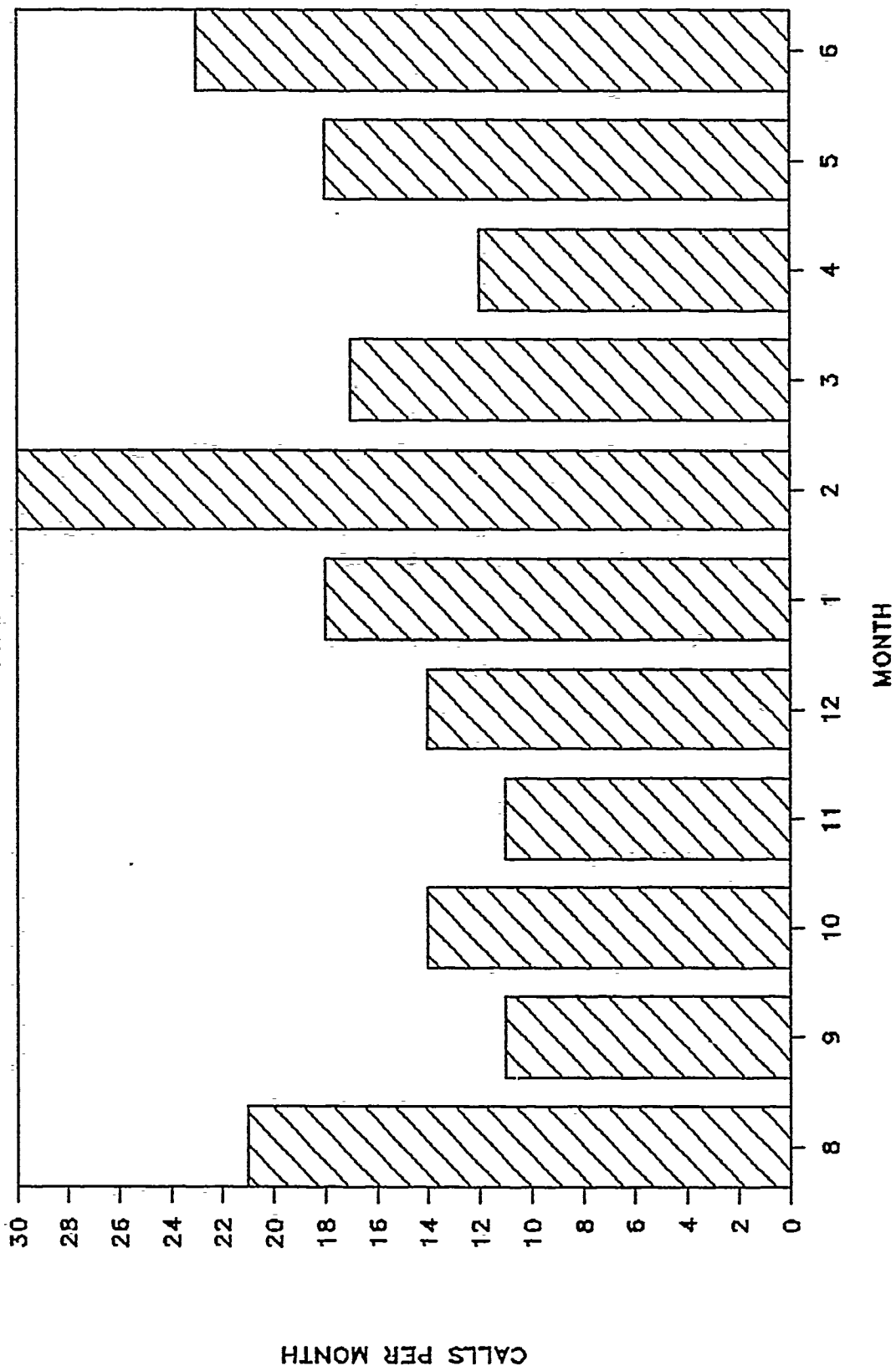
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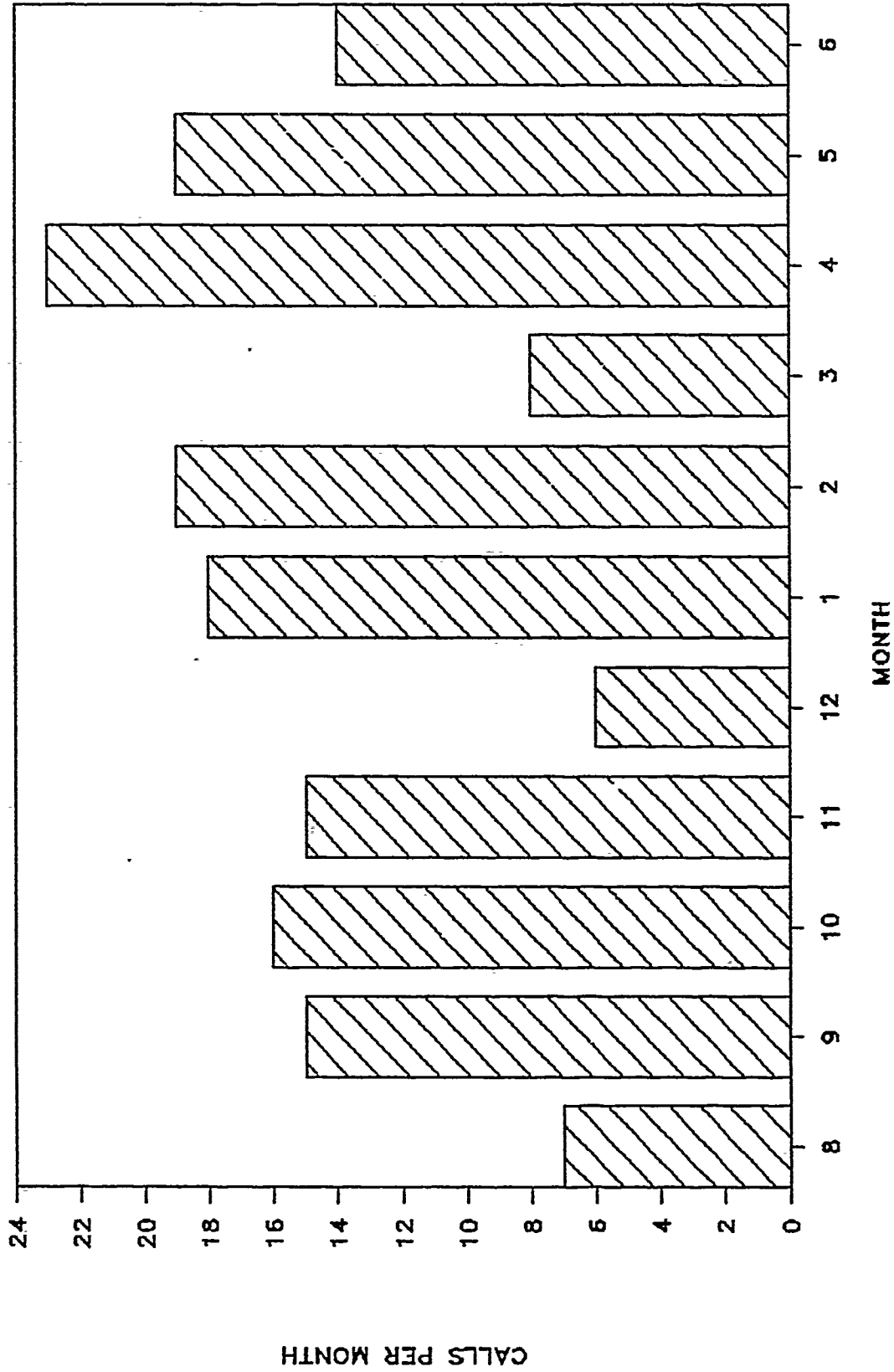
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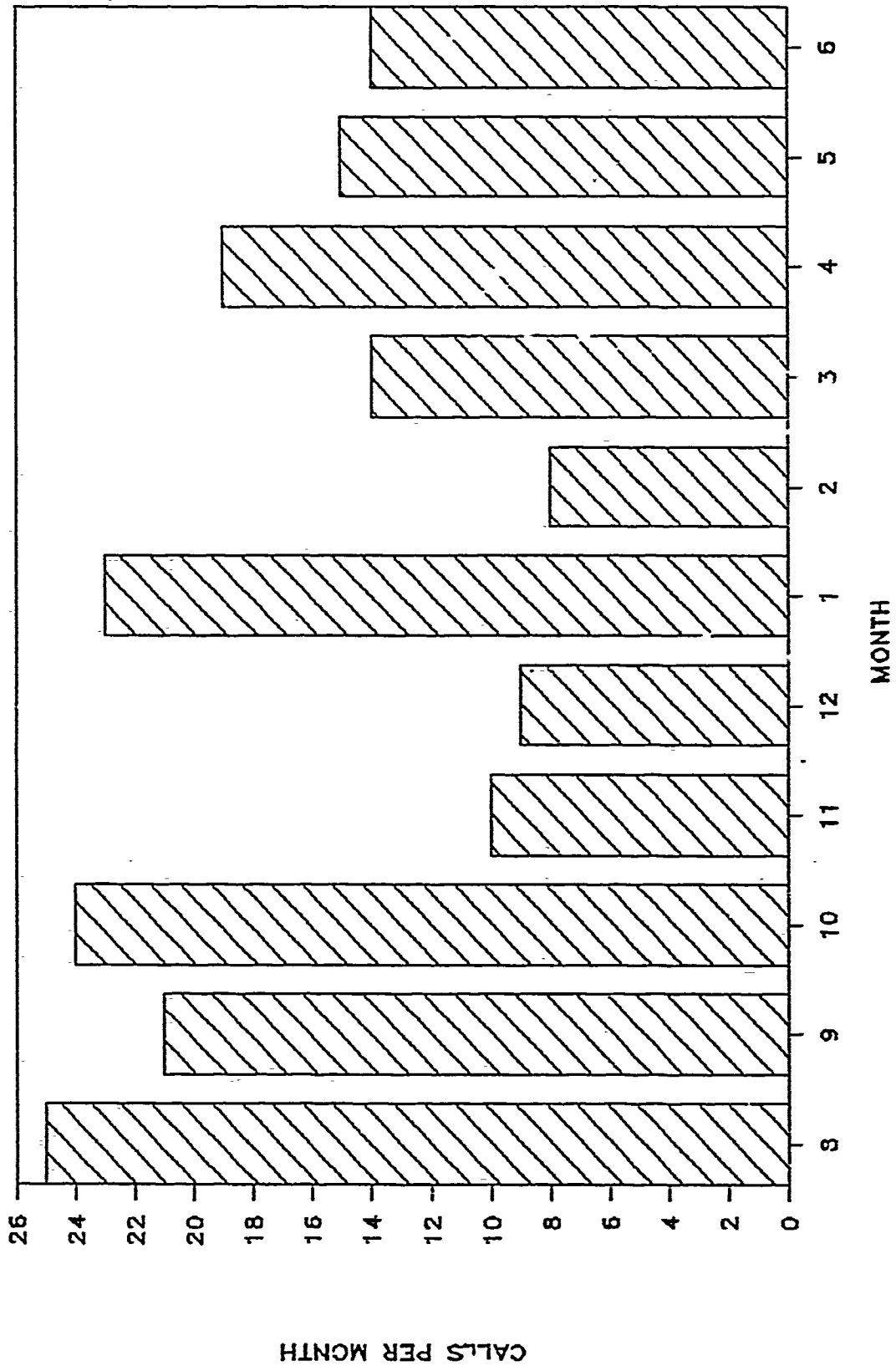
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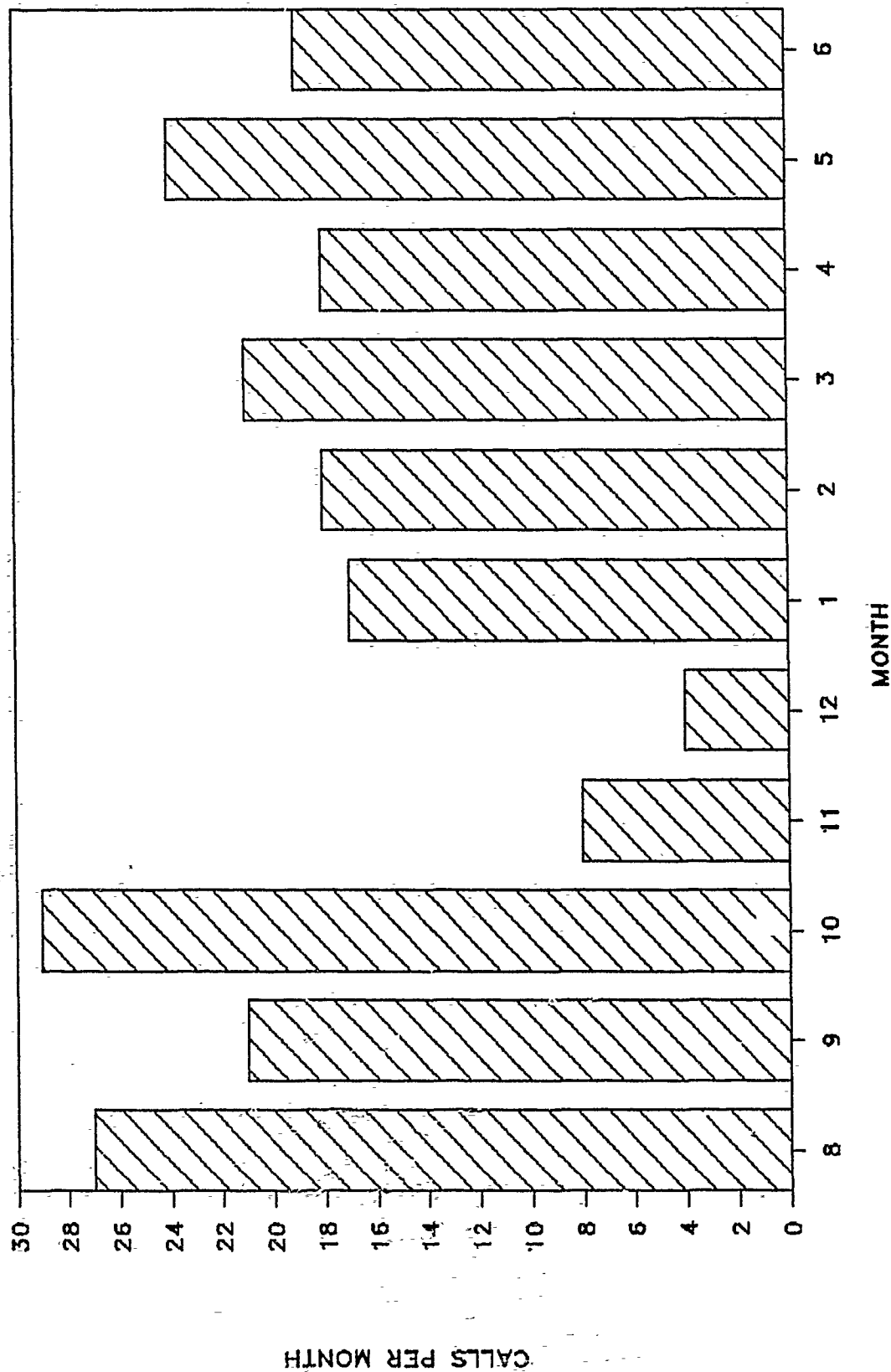
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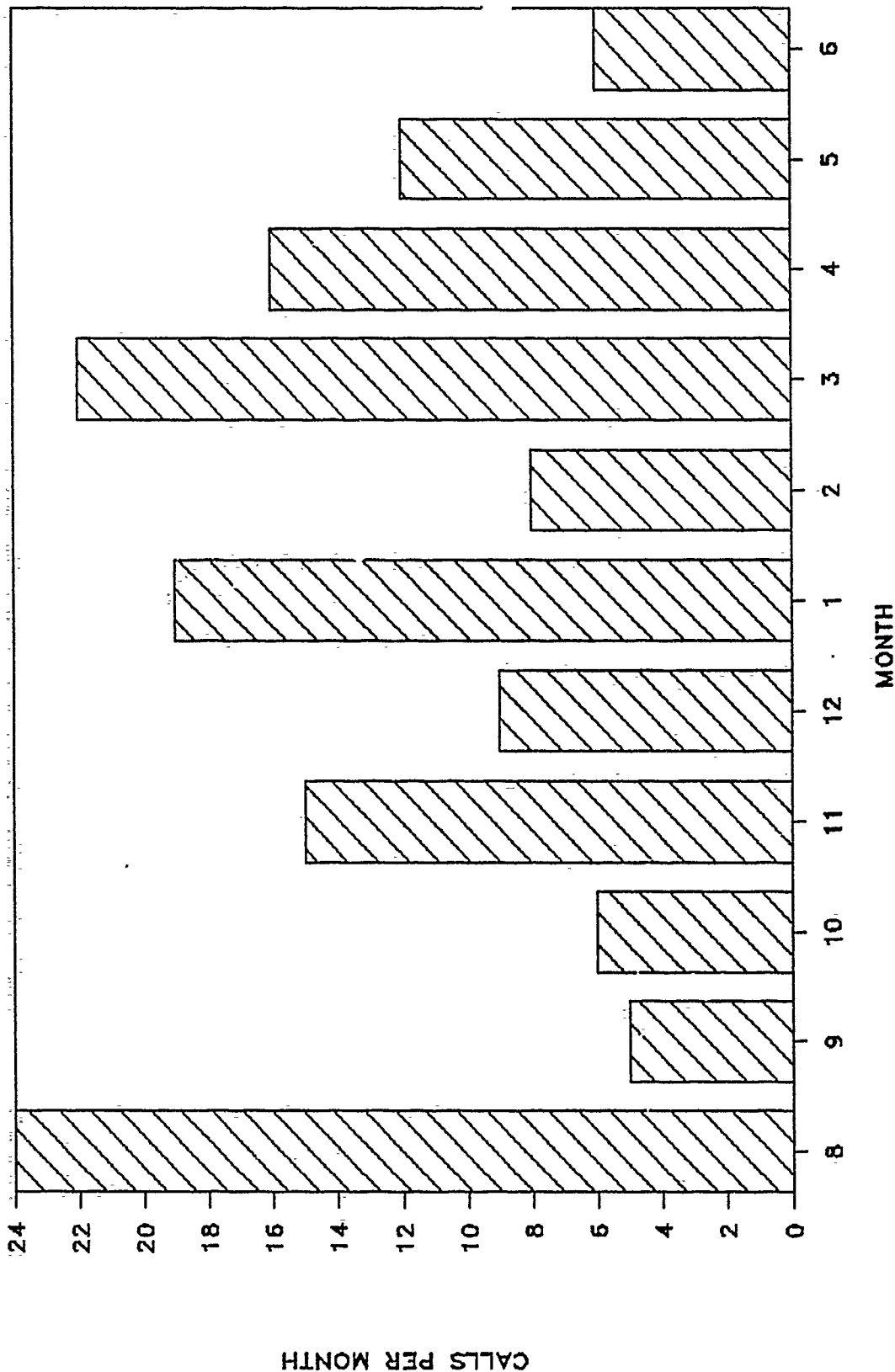
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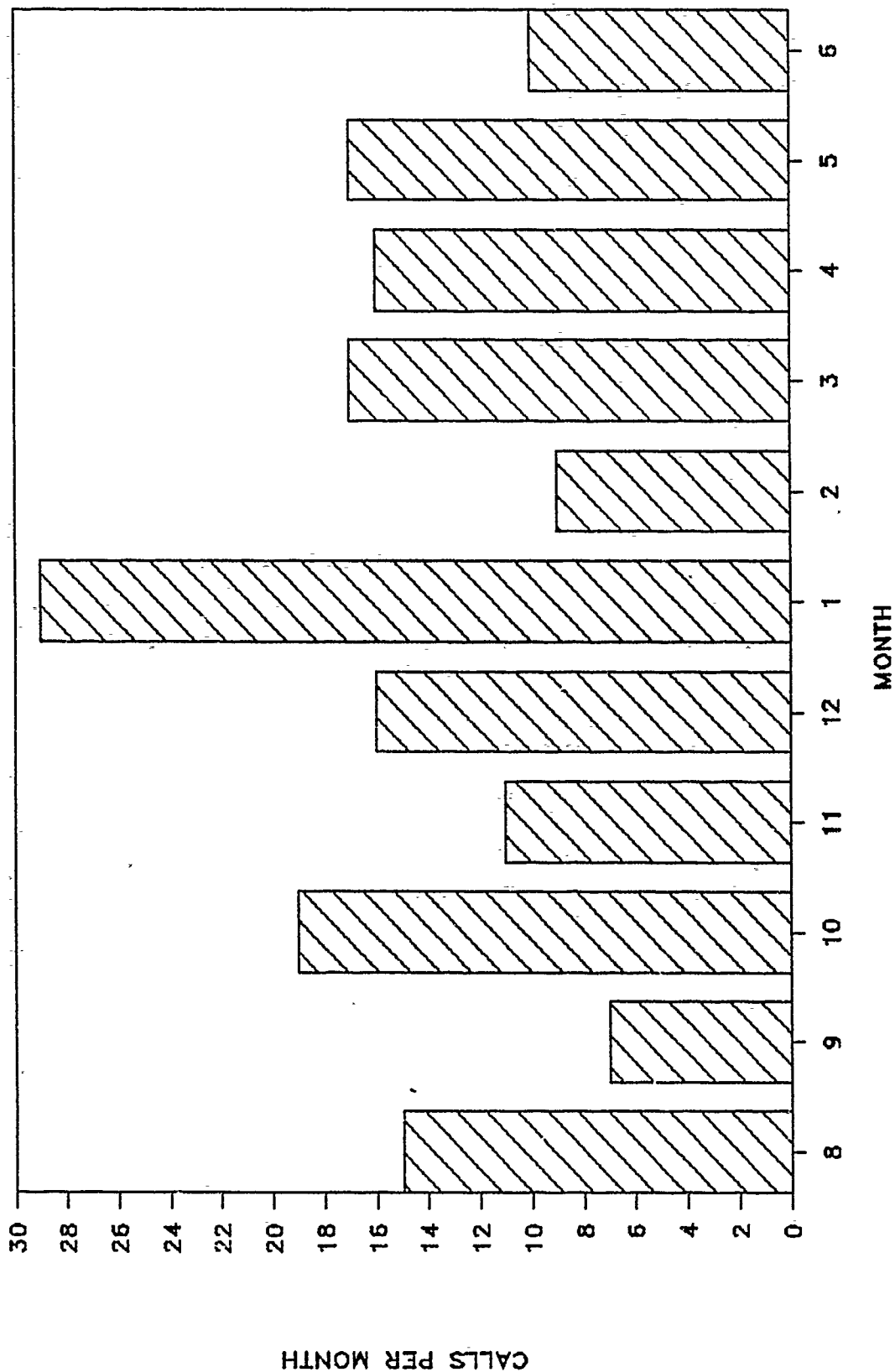
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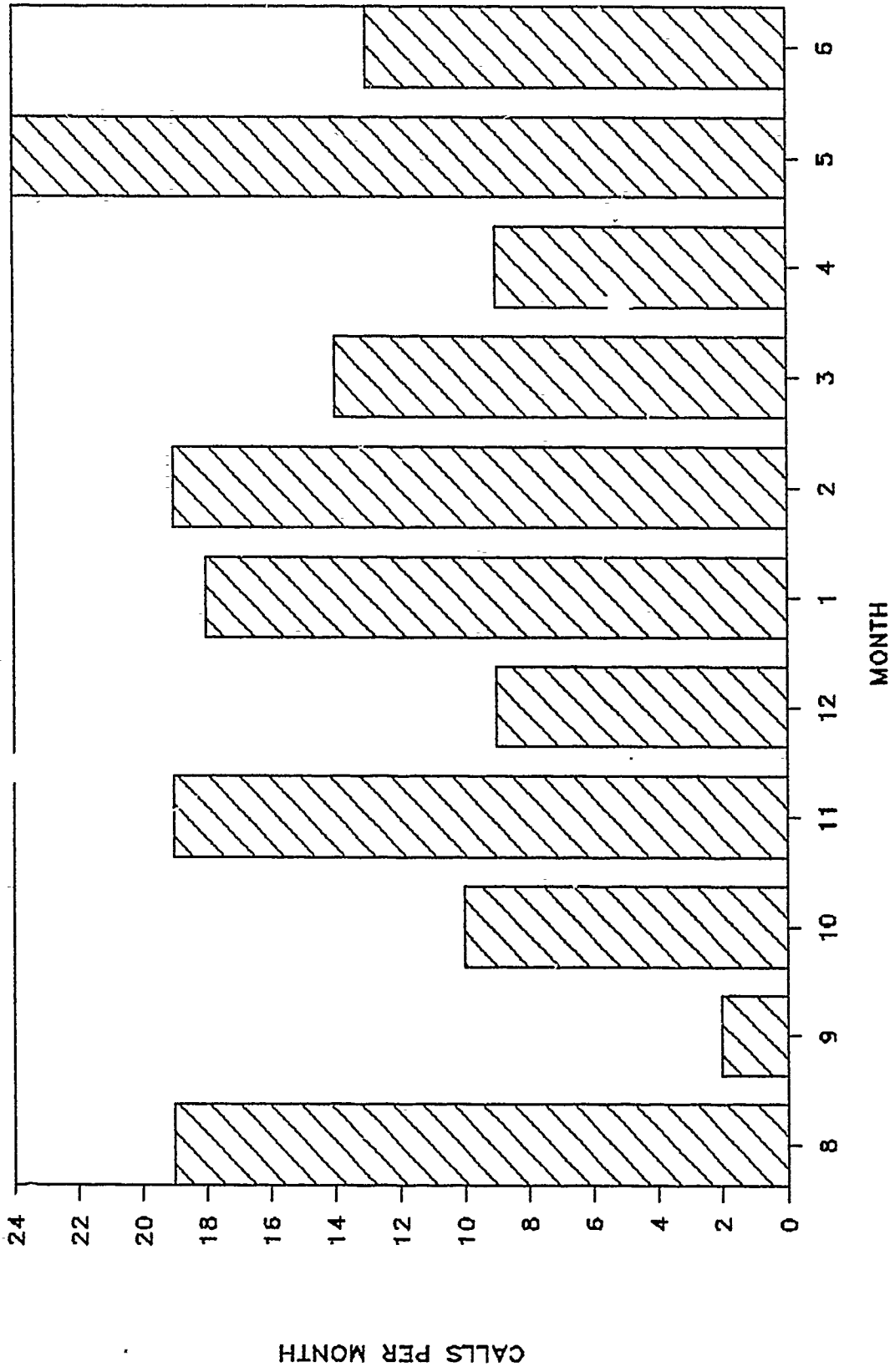
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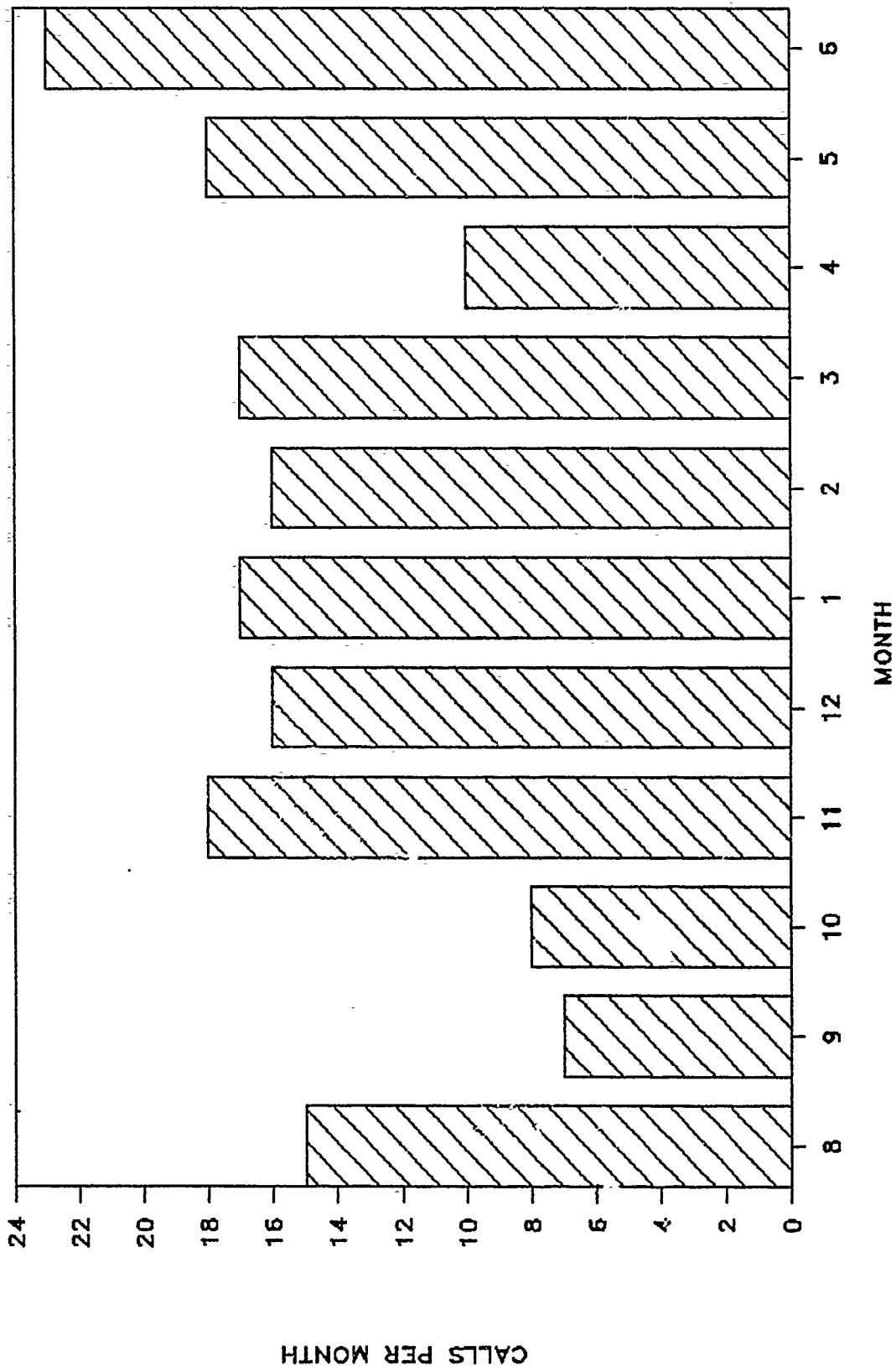
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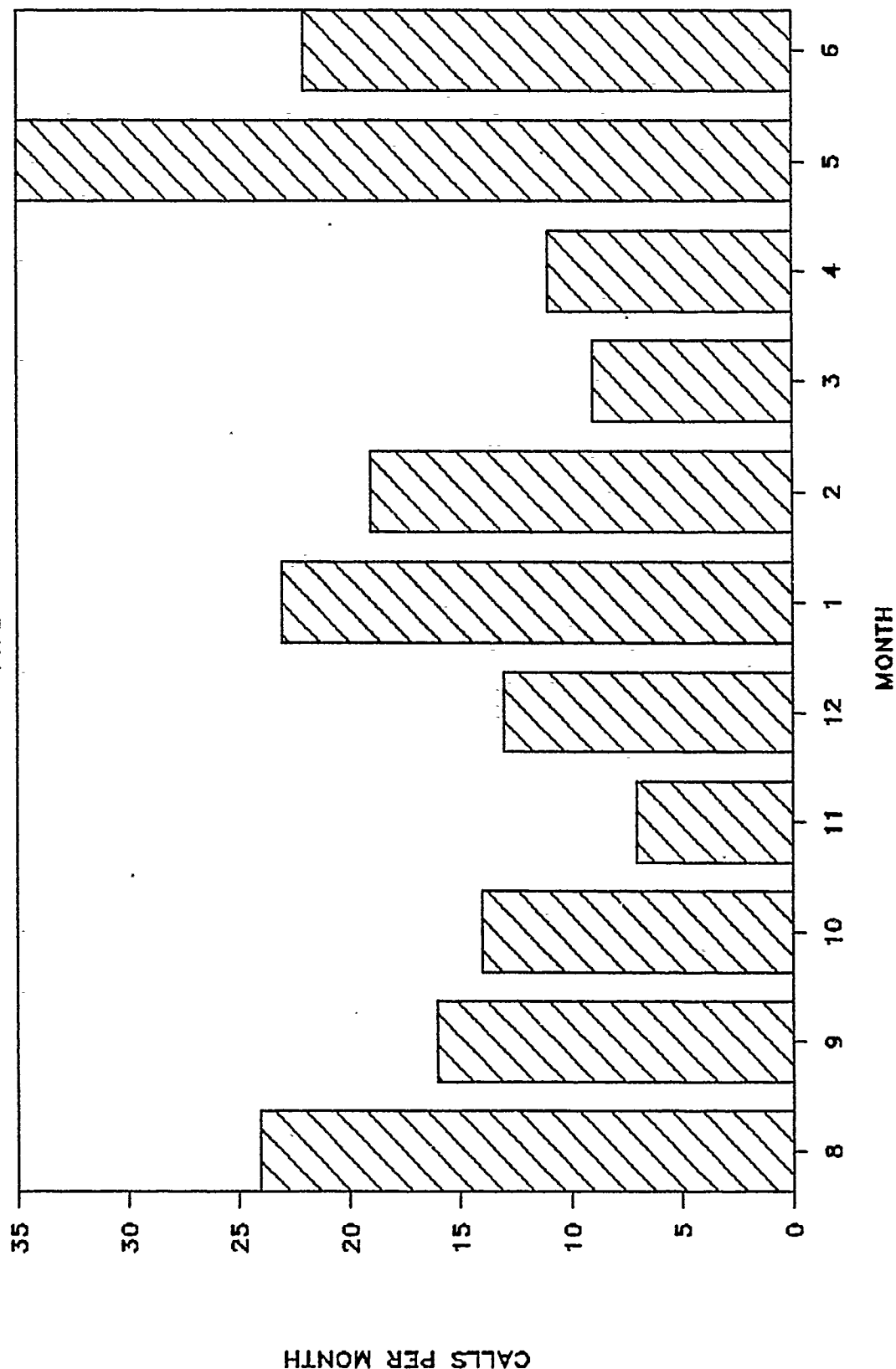
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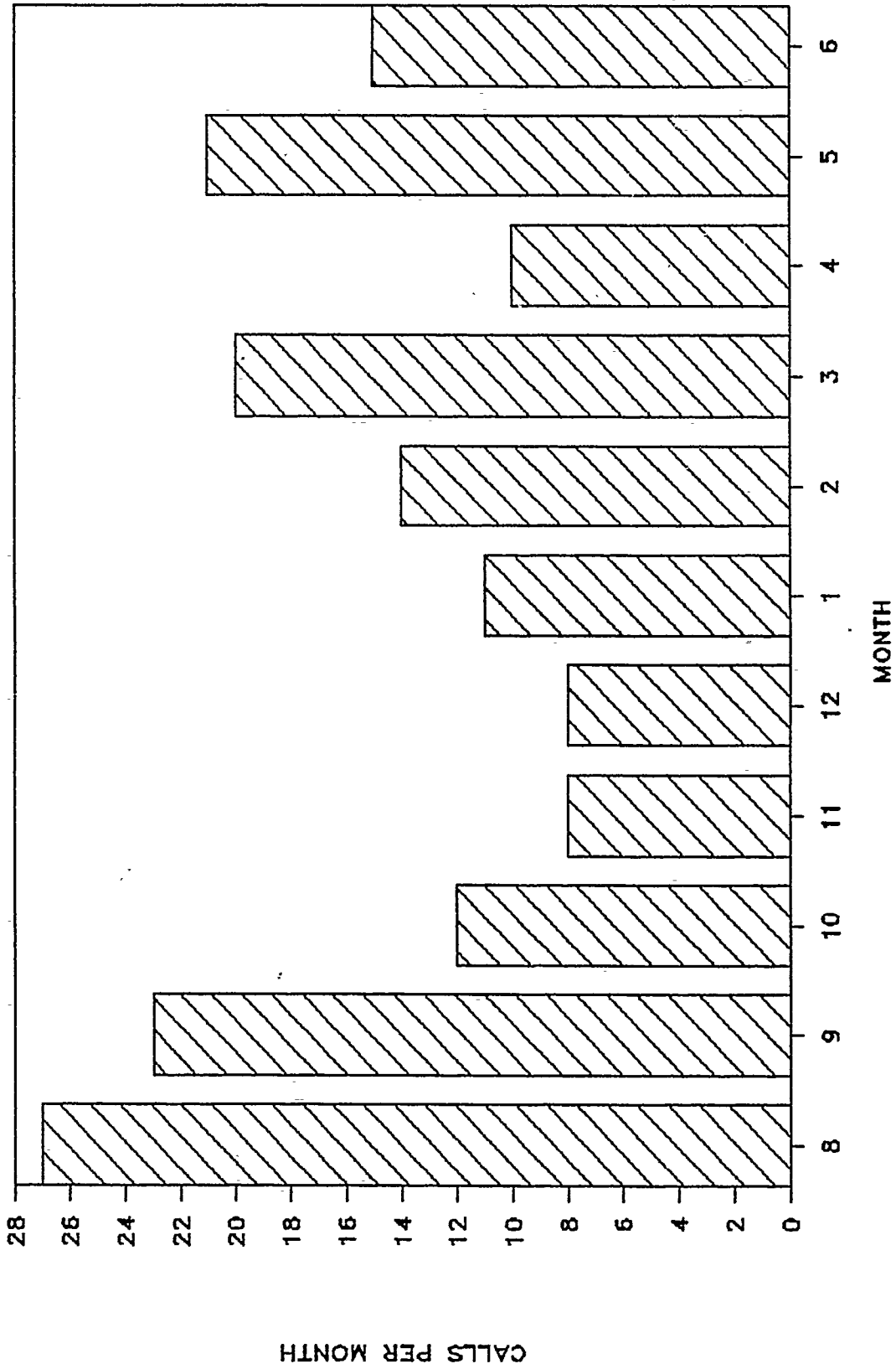
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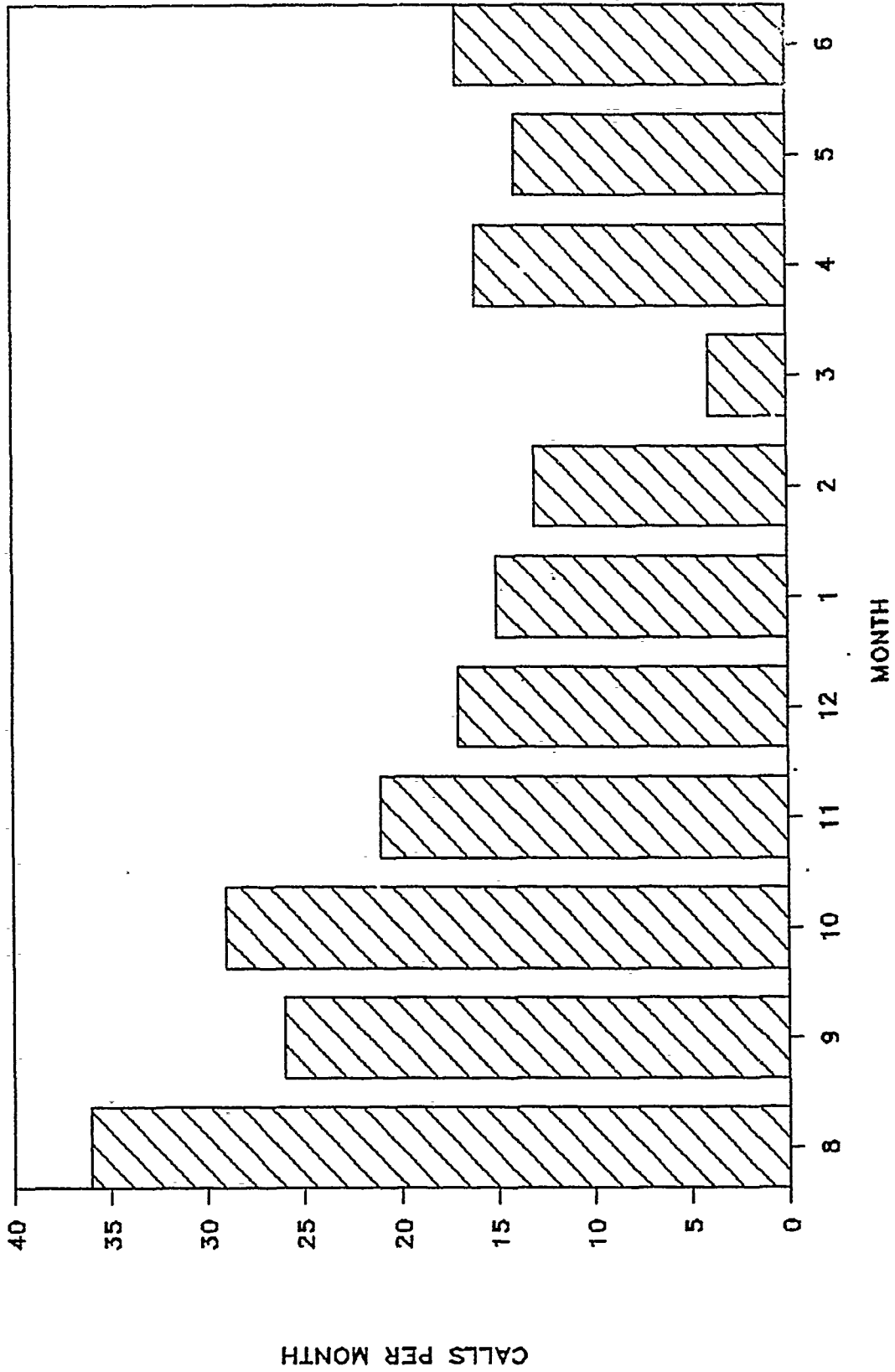
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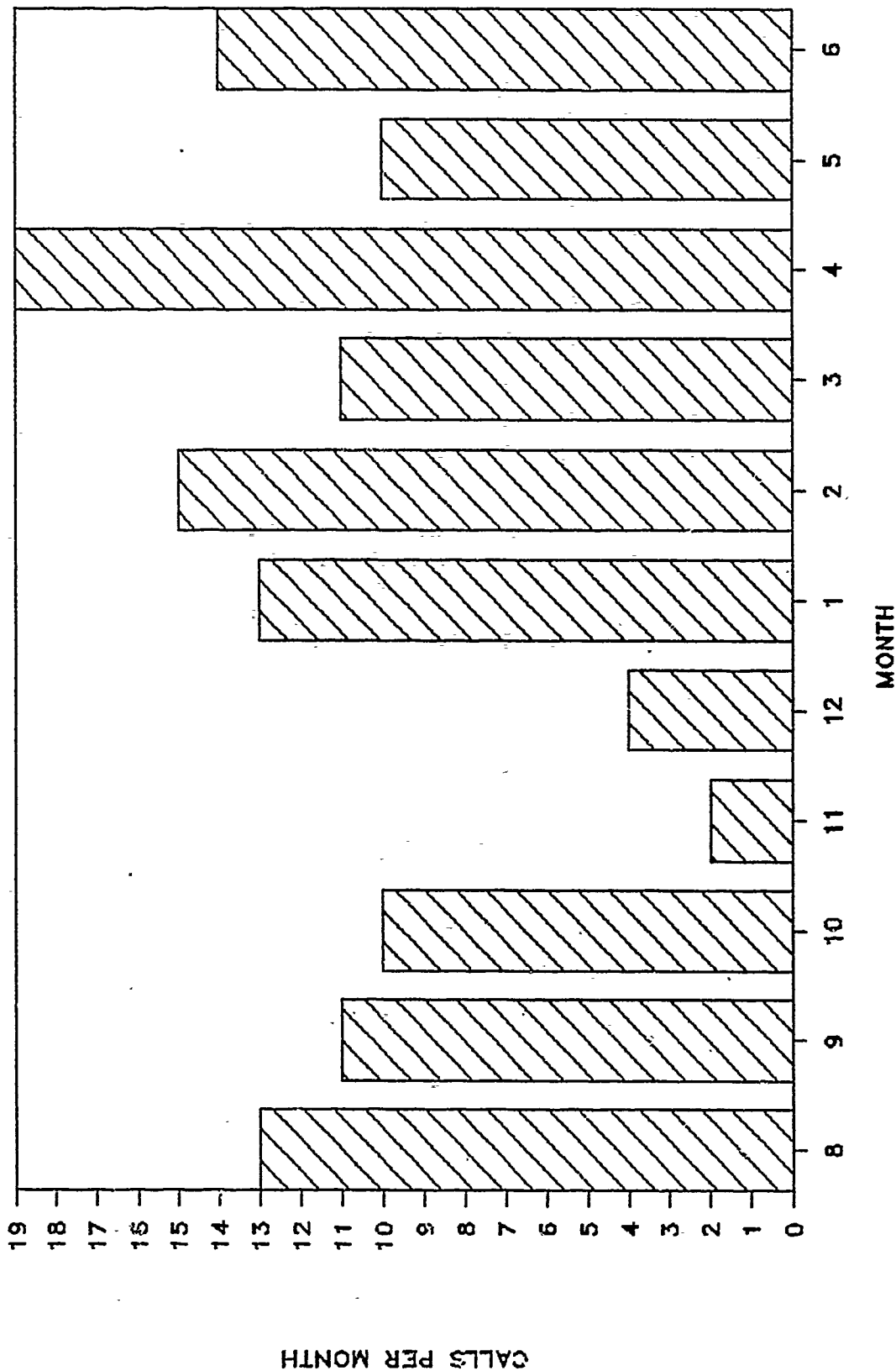
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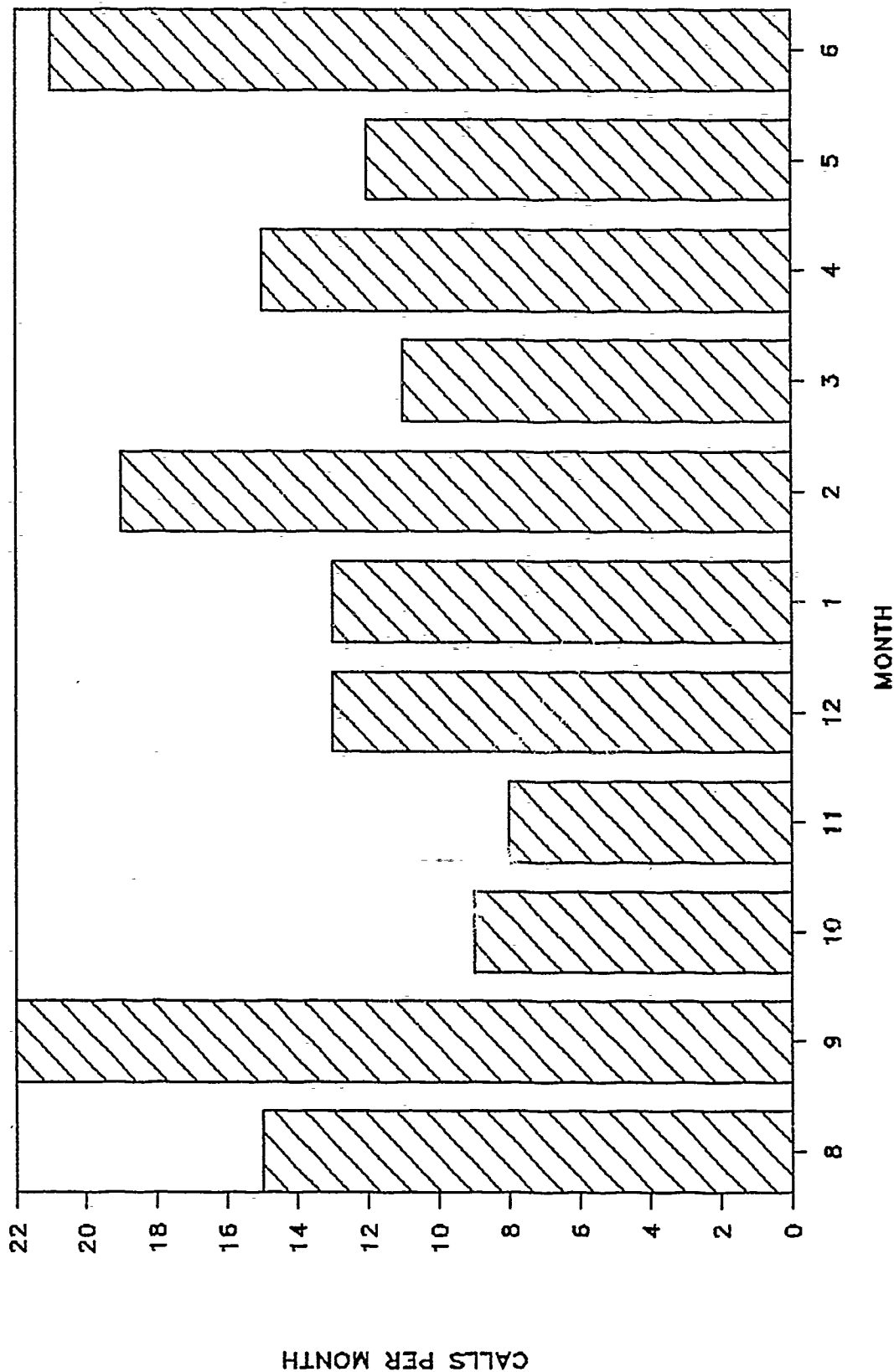
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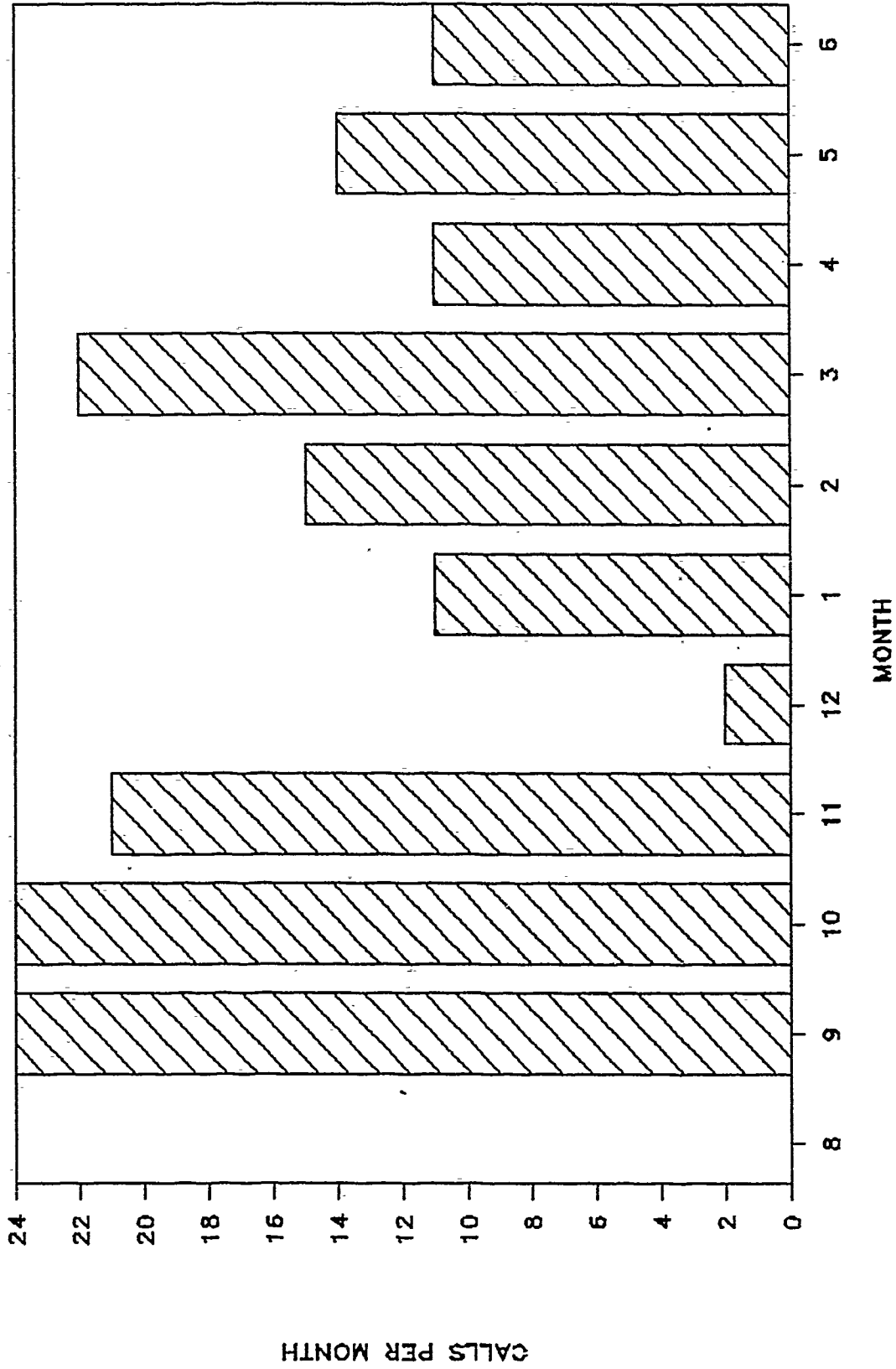


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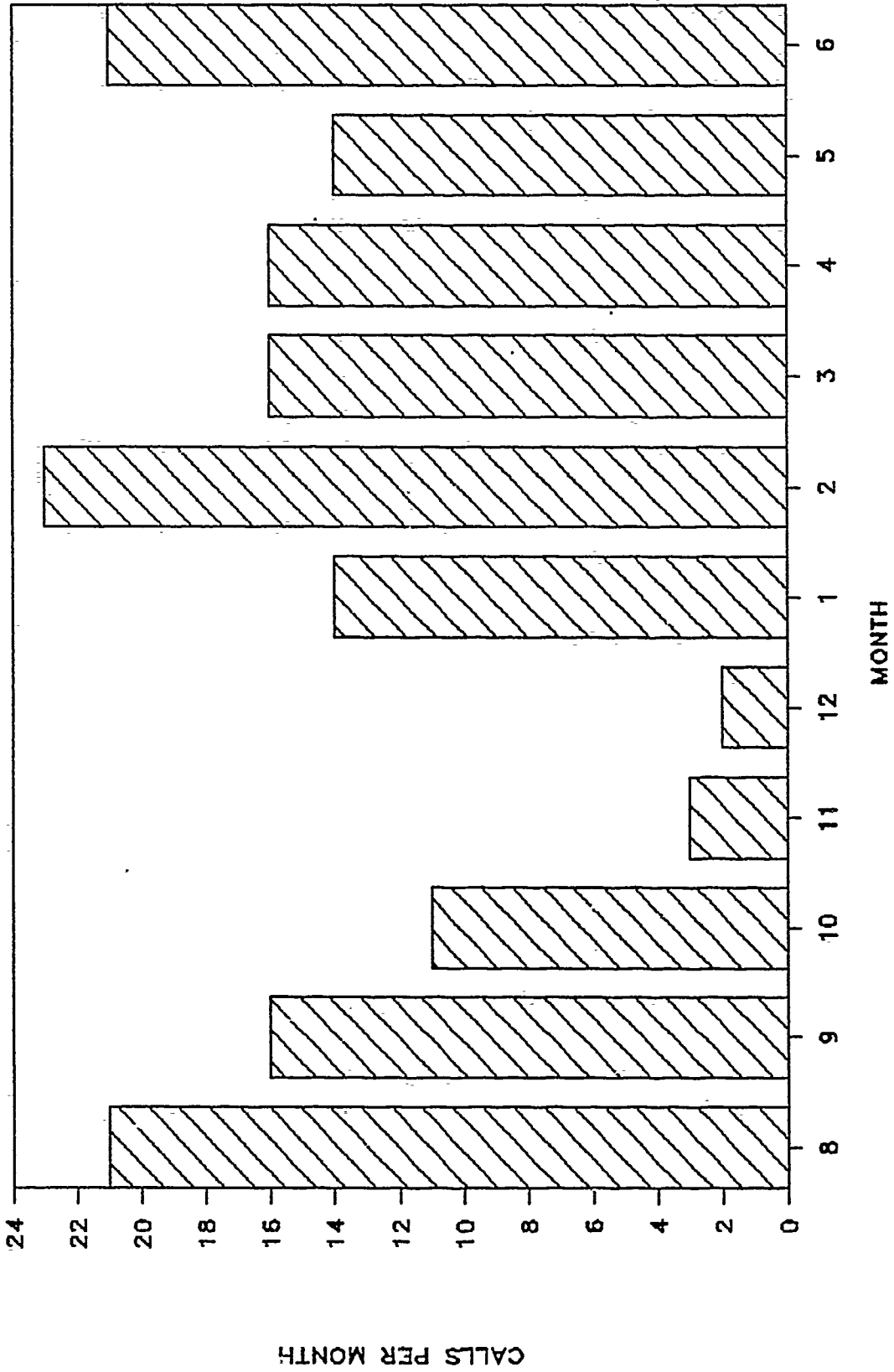
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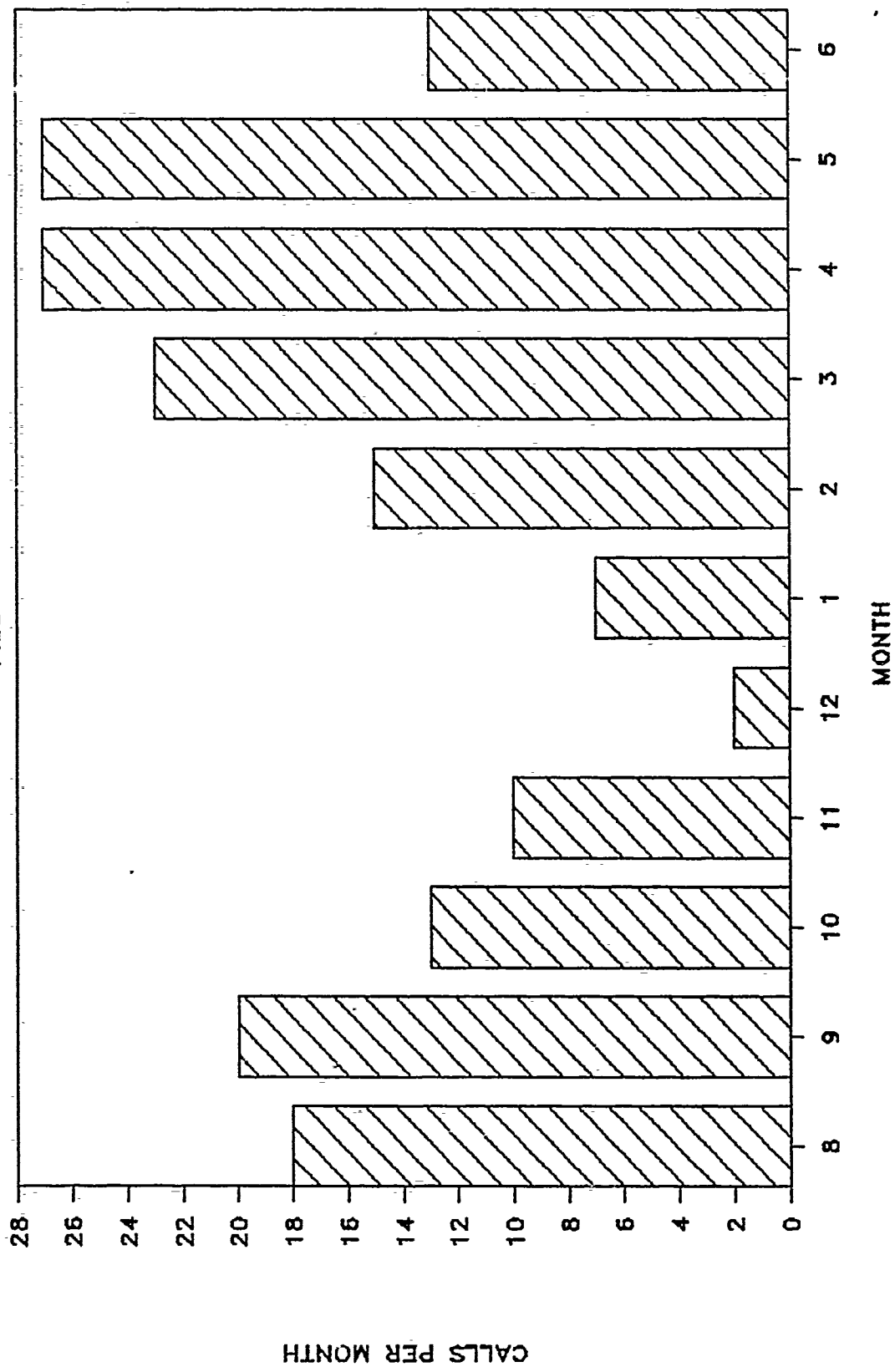
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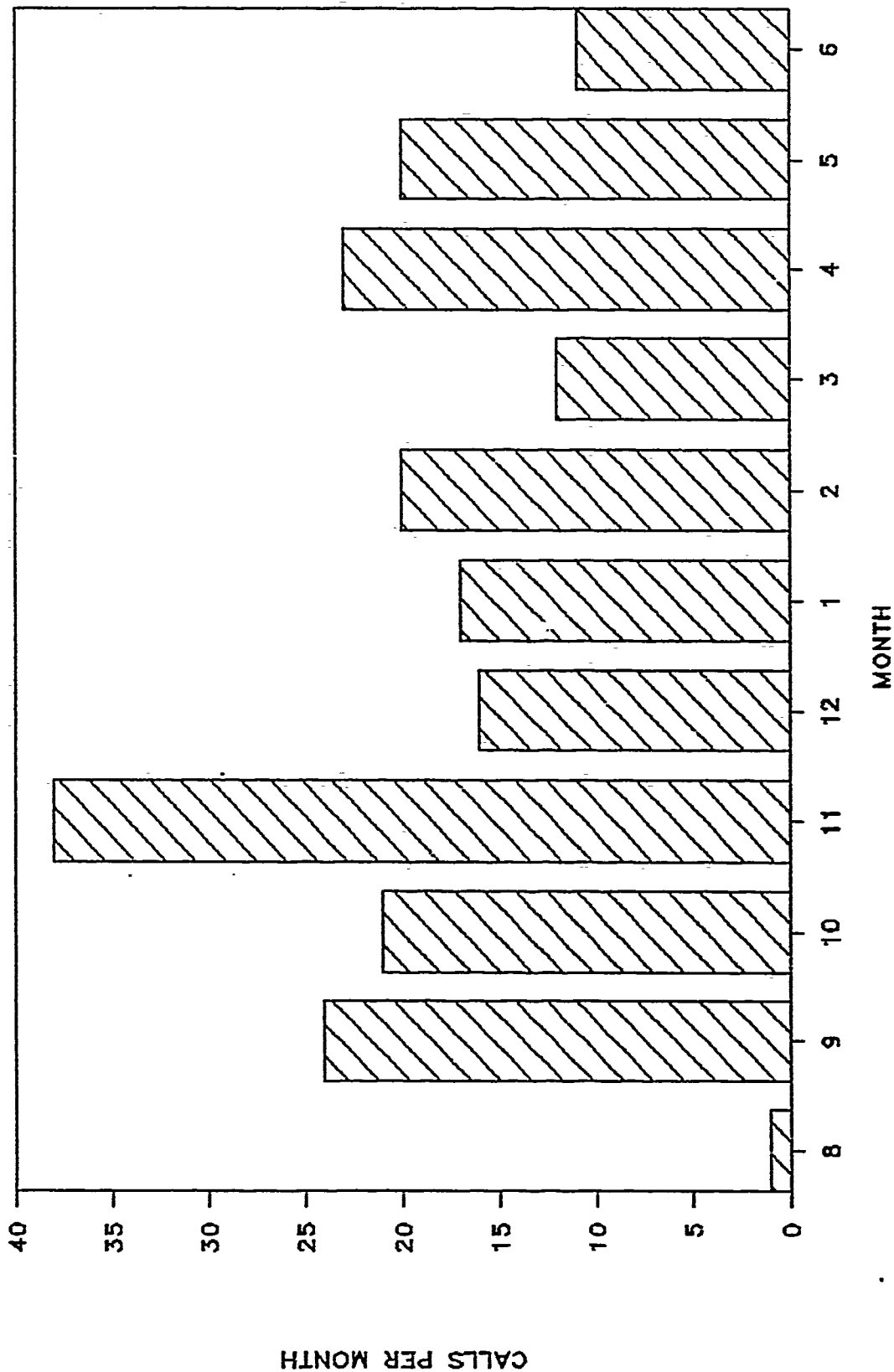
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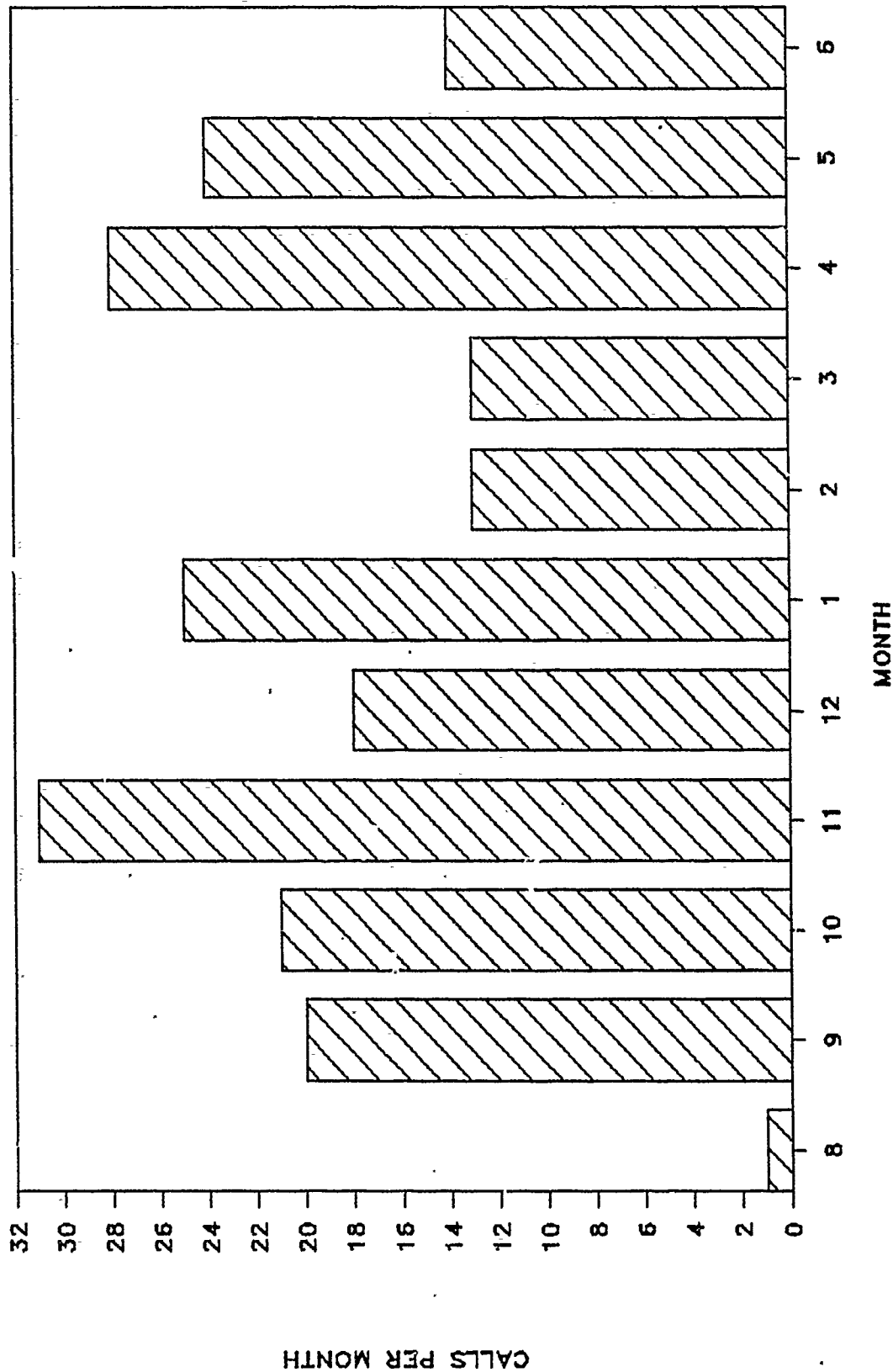
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MAINT. CALLS (1989/90)

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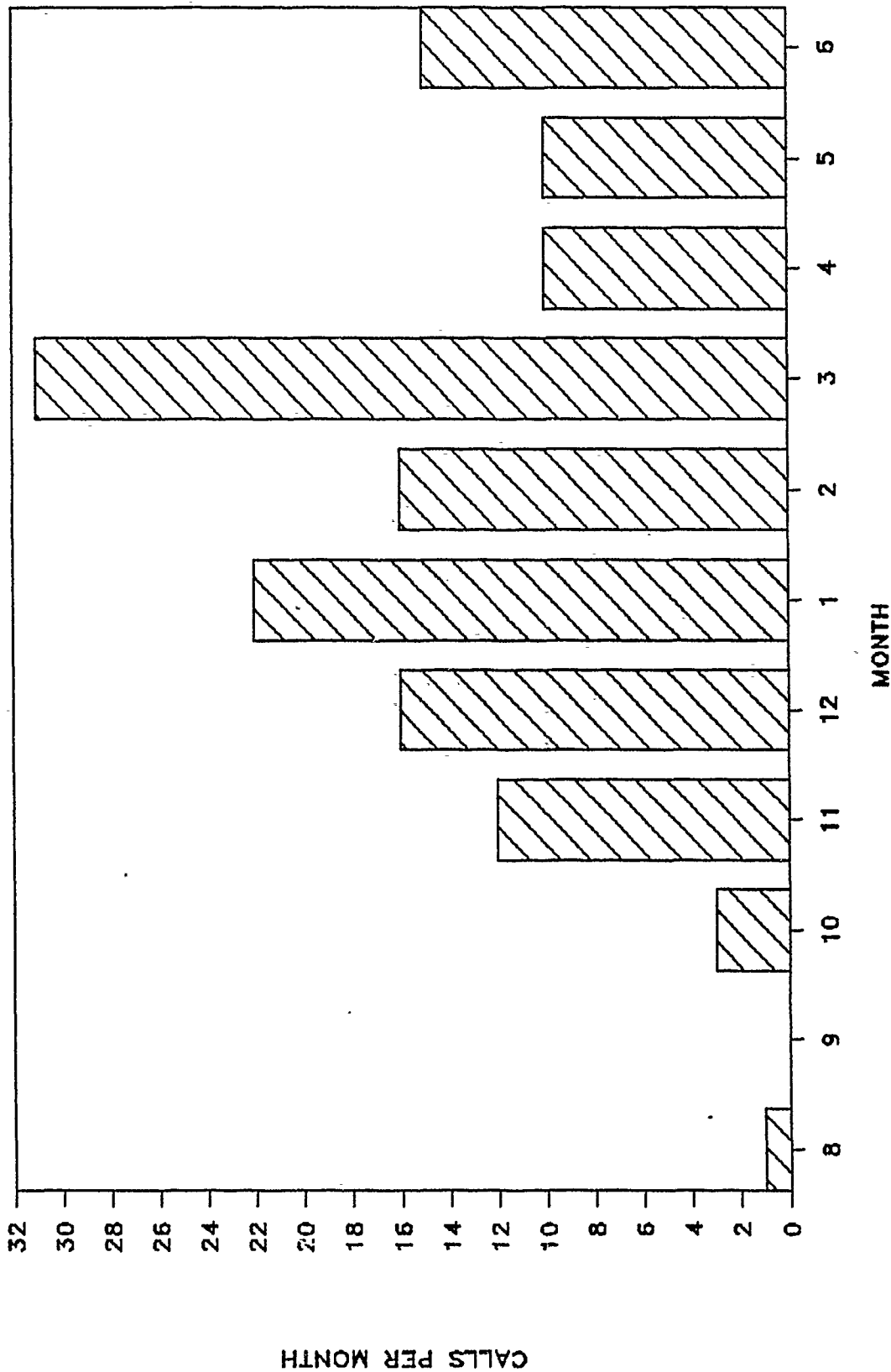


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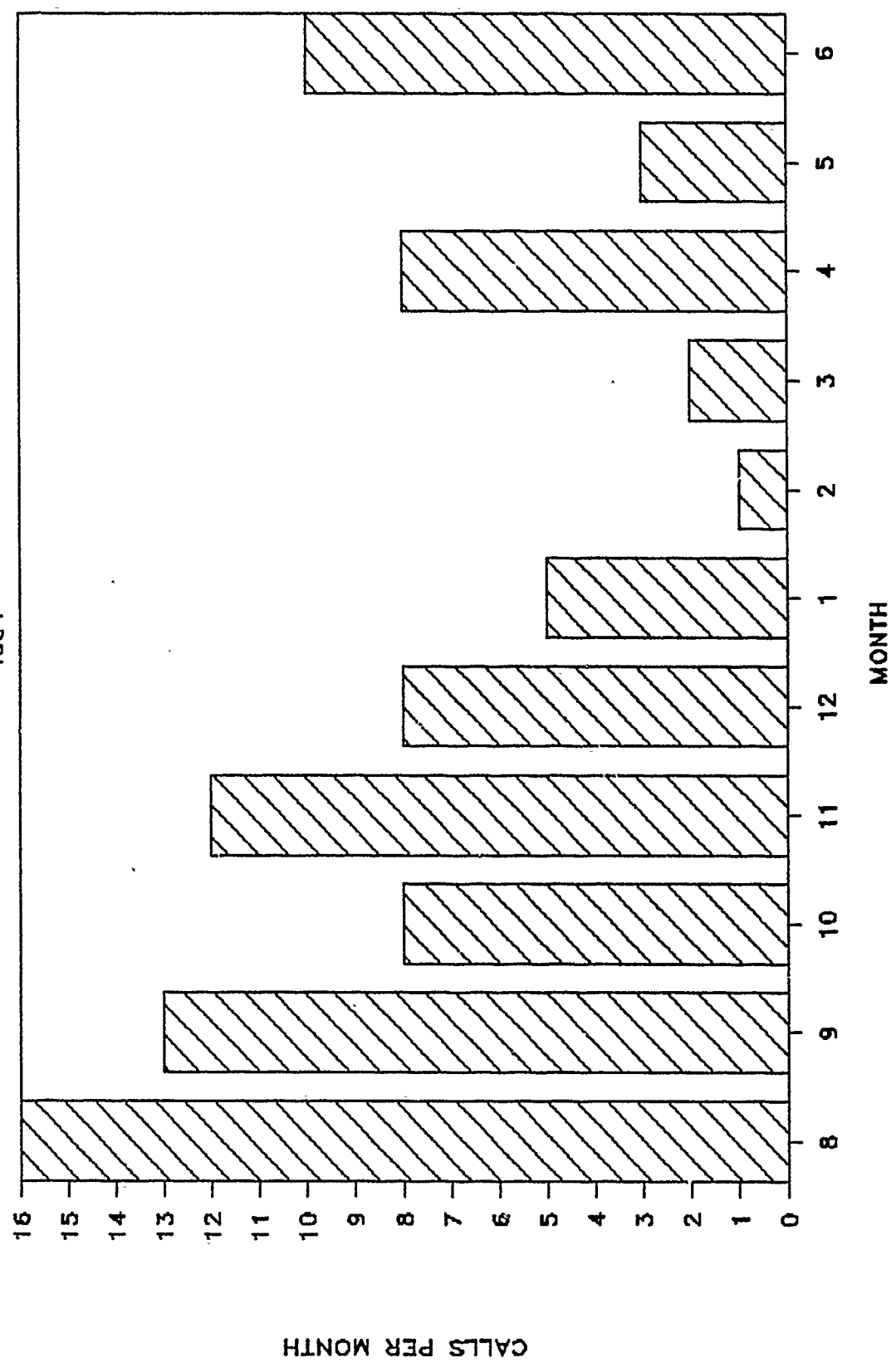
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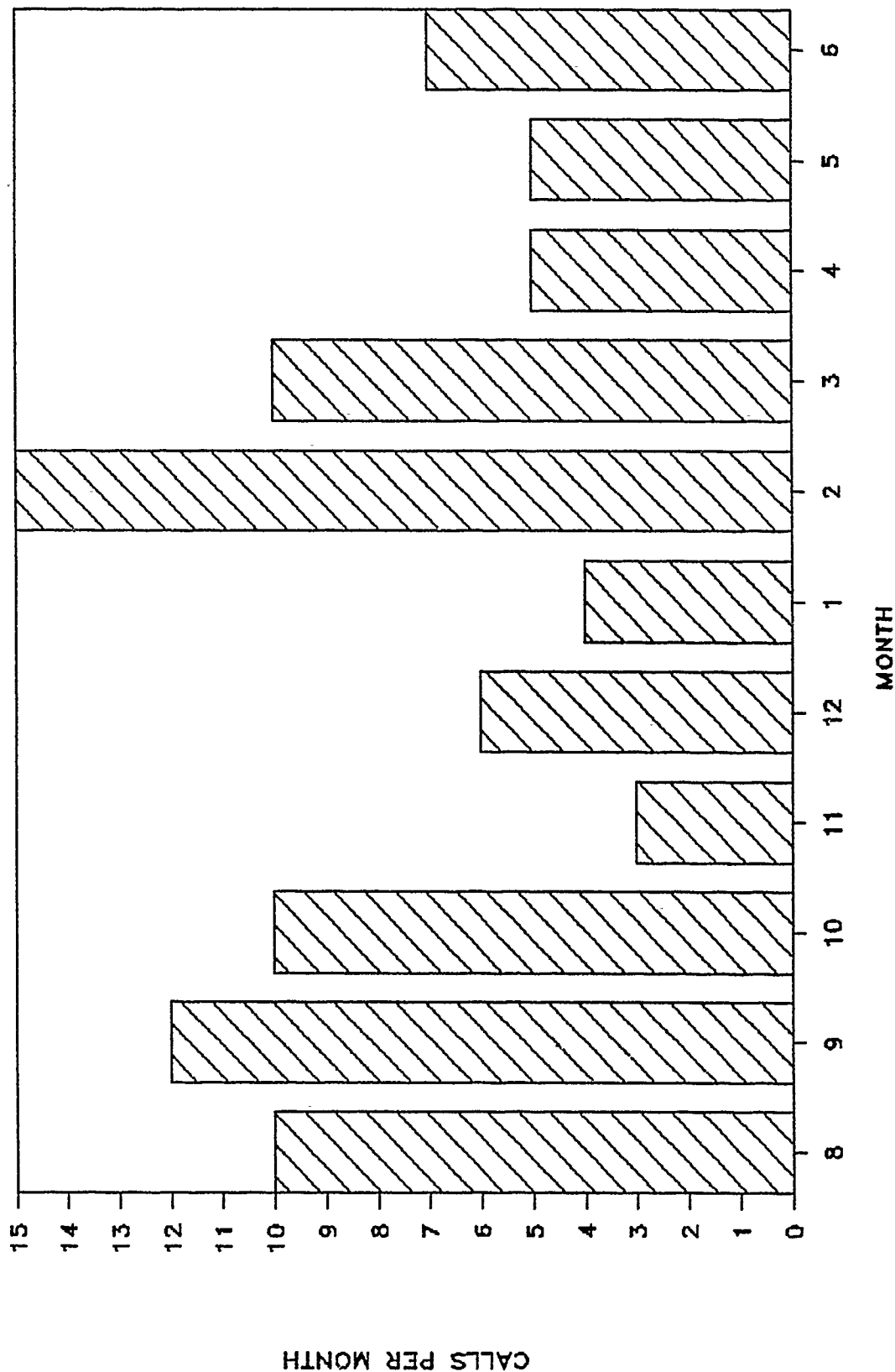
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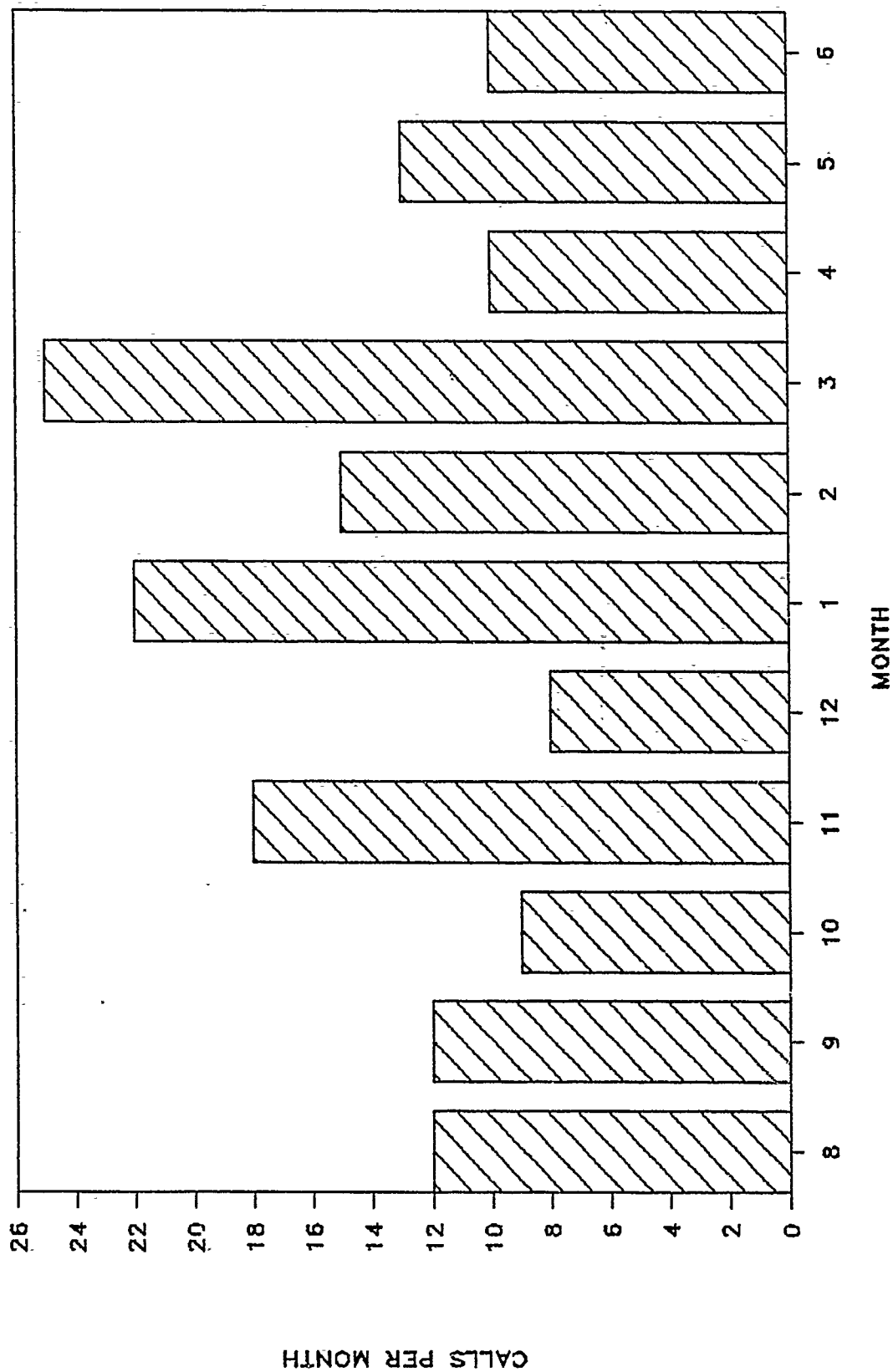
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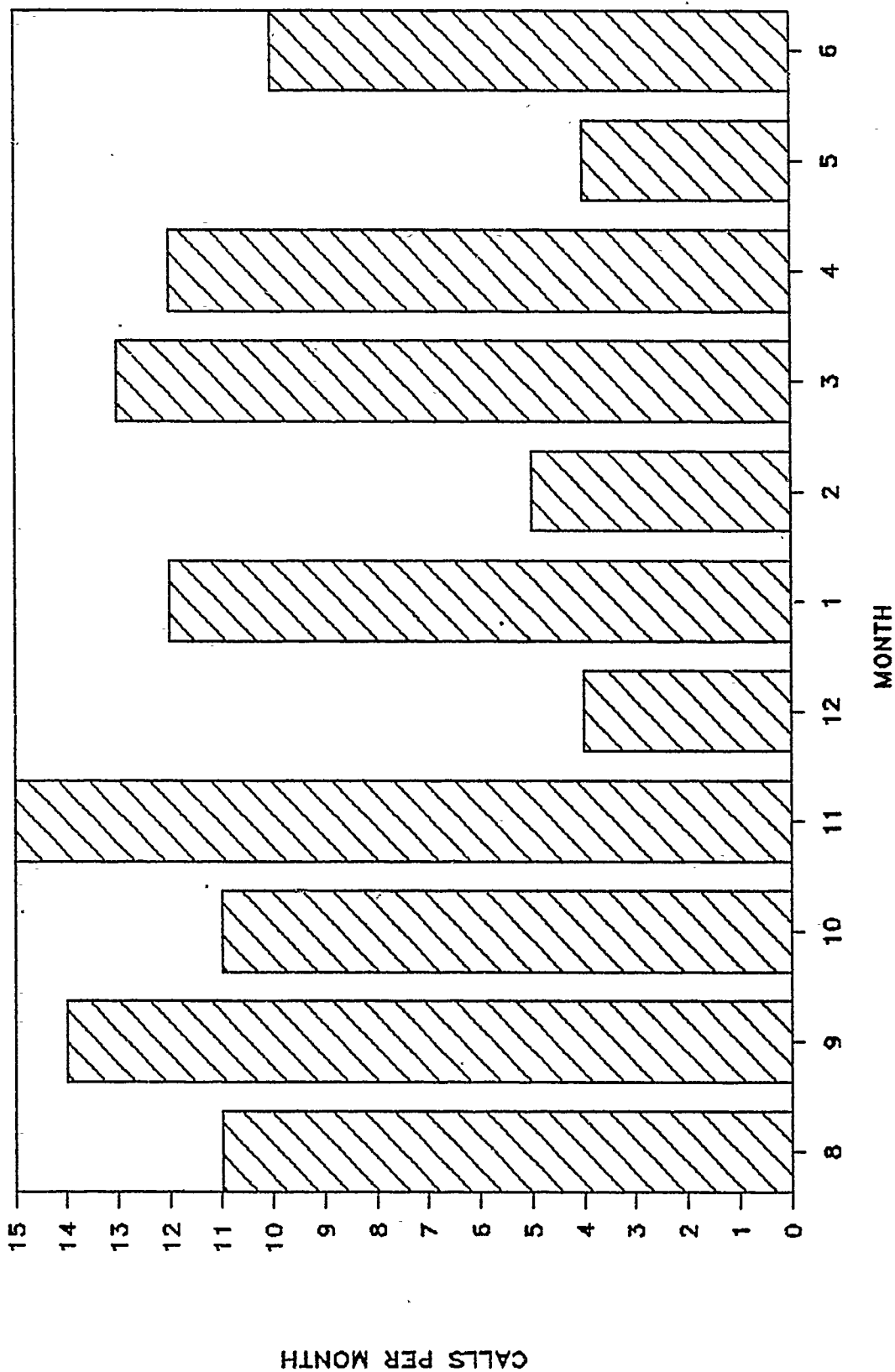
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0300'8



MAINT. CALLS (1989/90)

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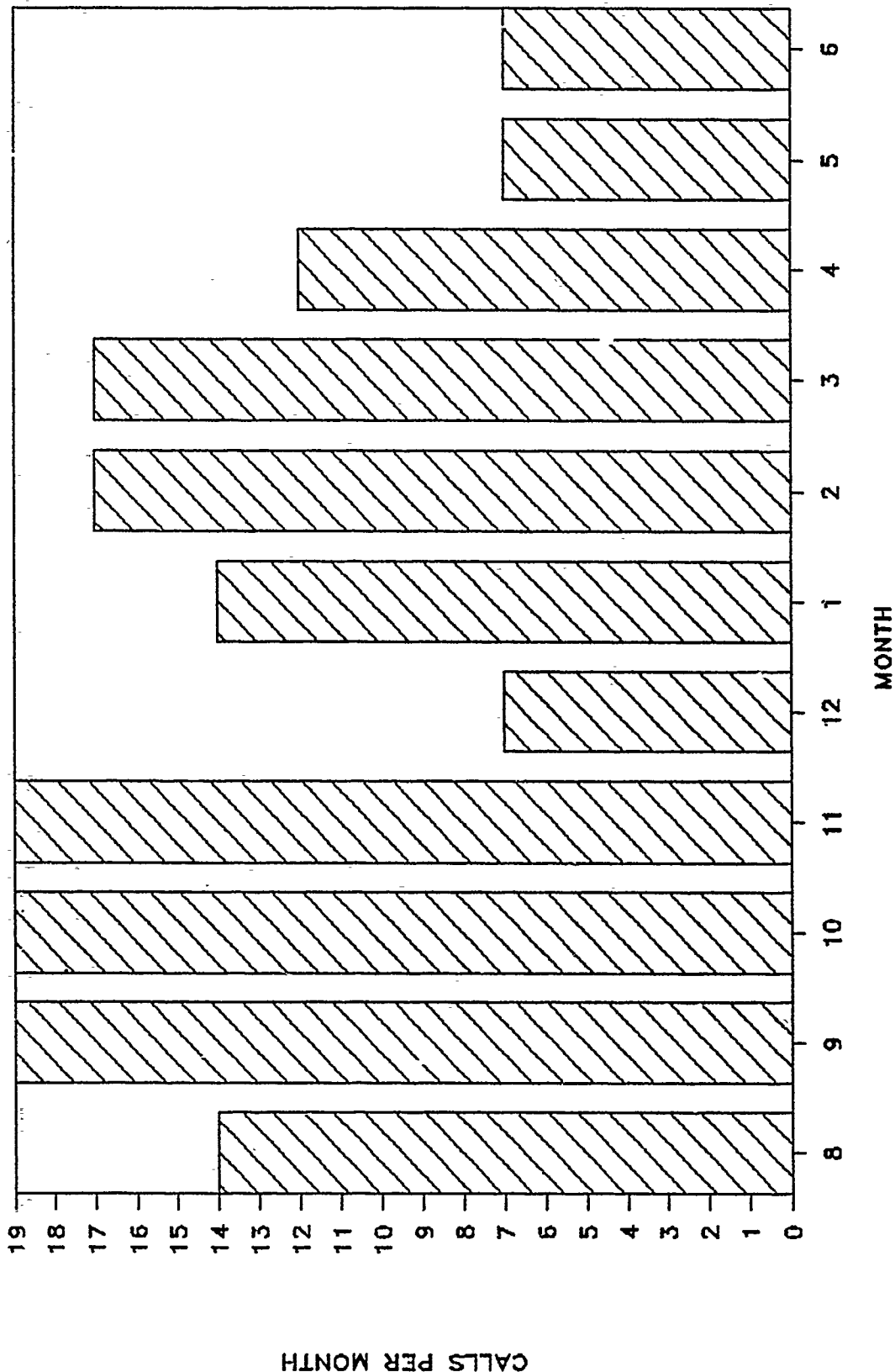


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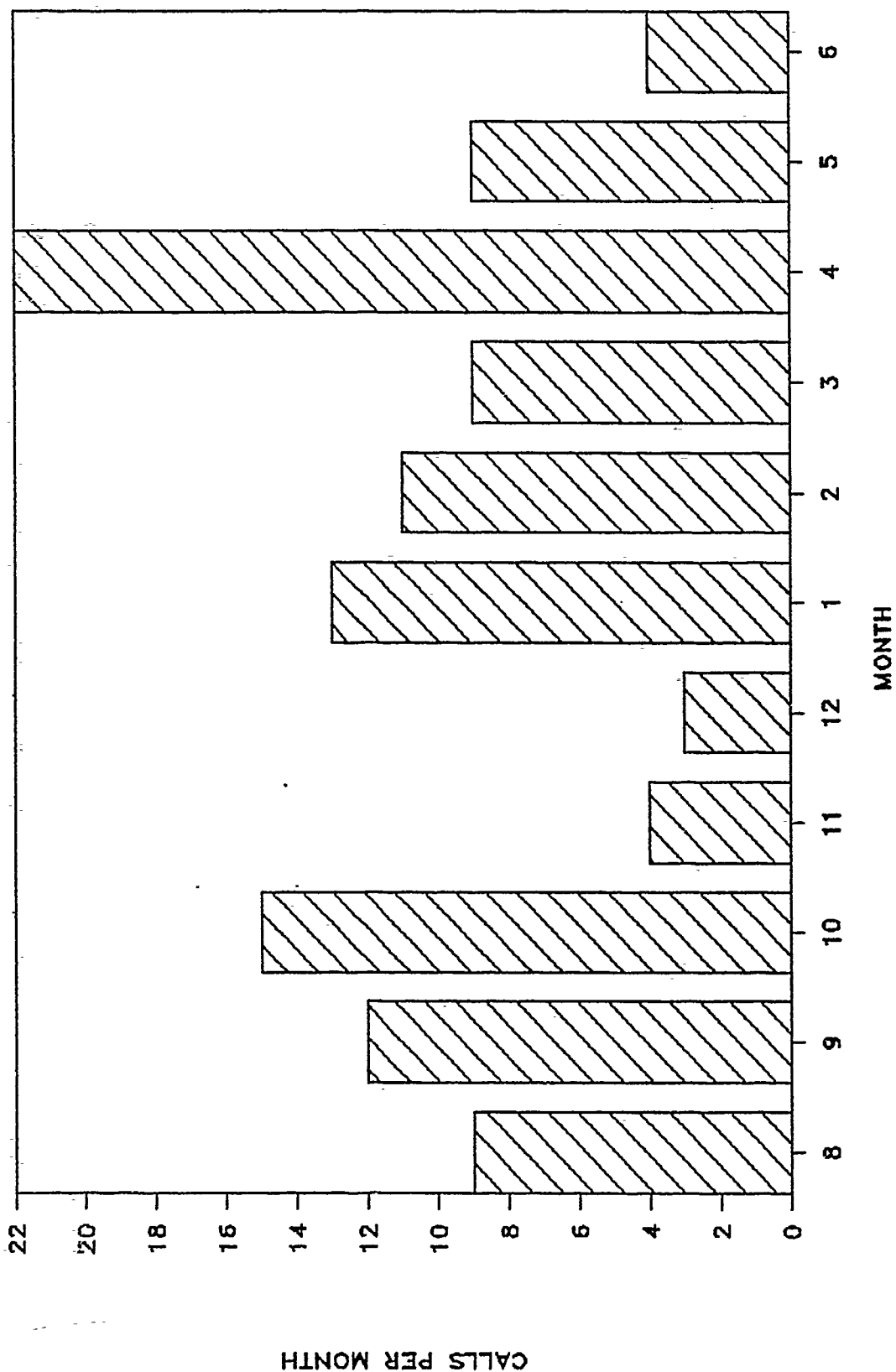
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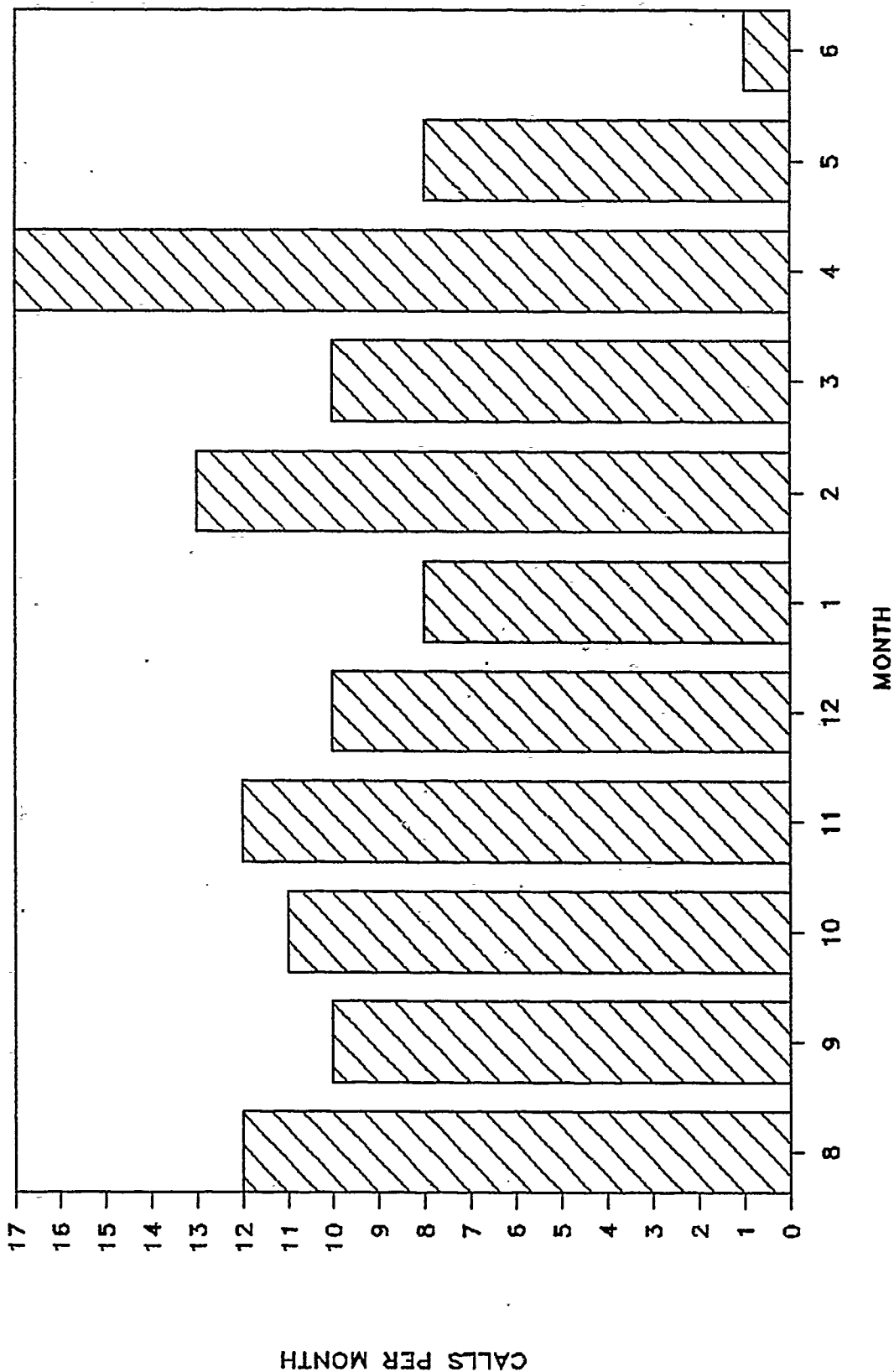
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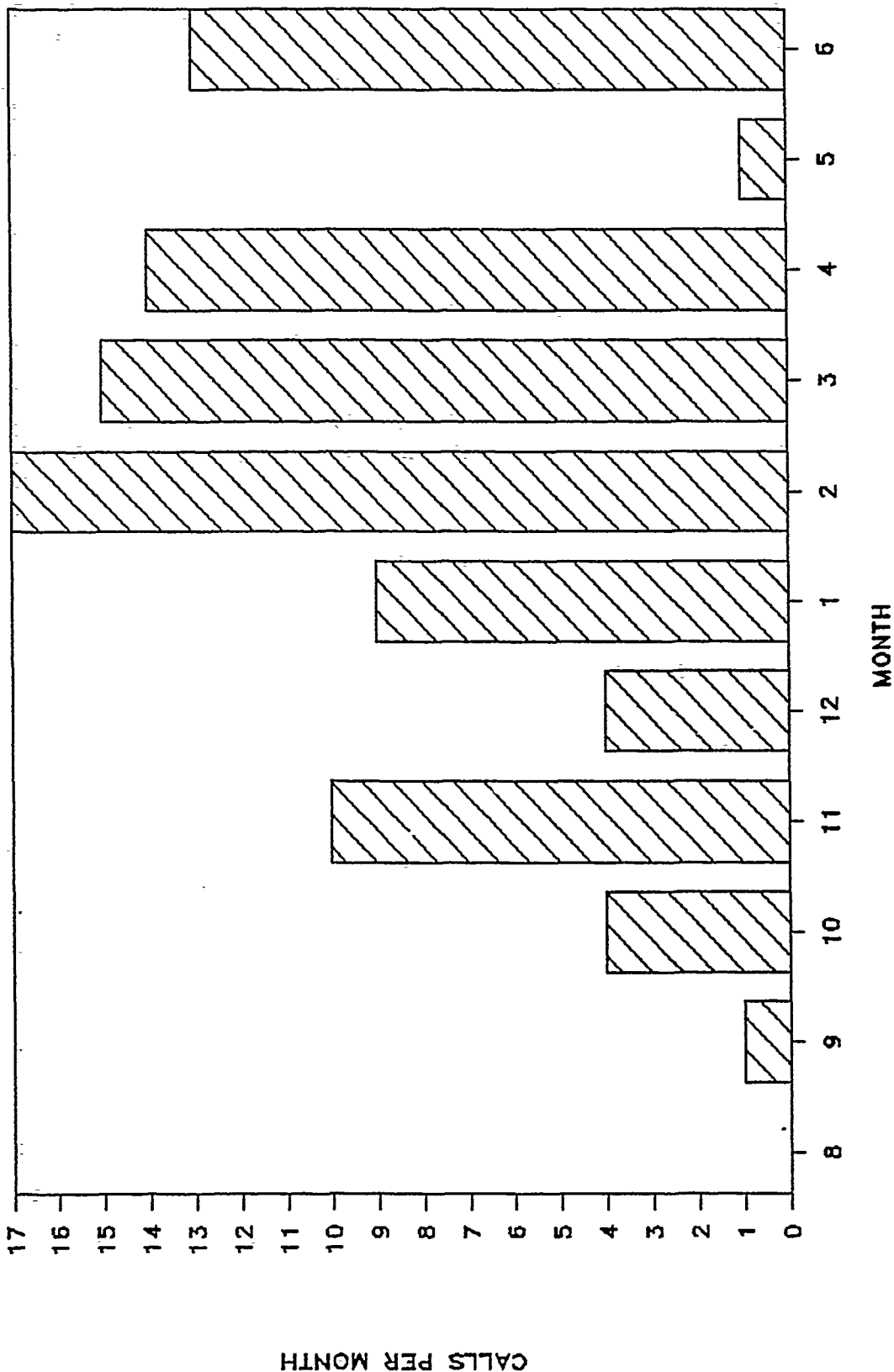
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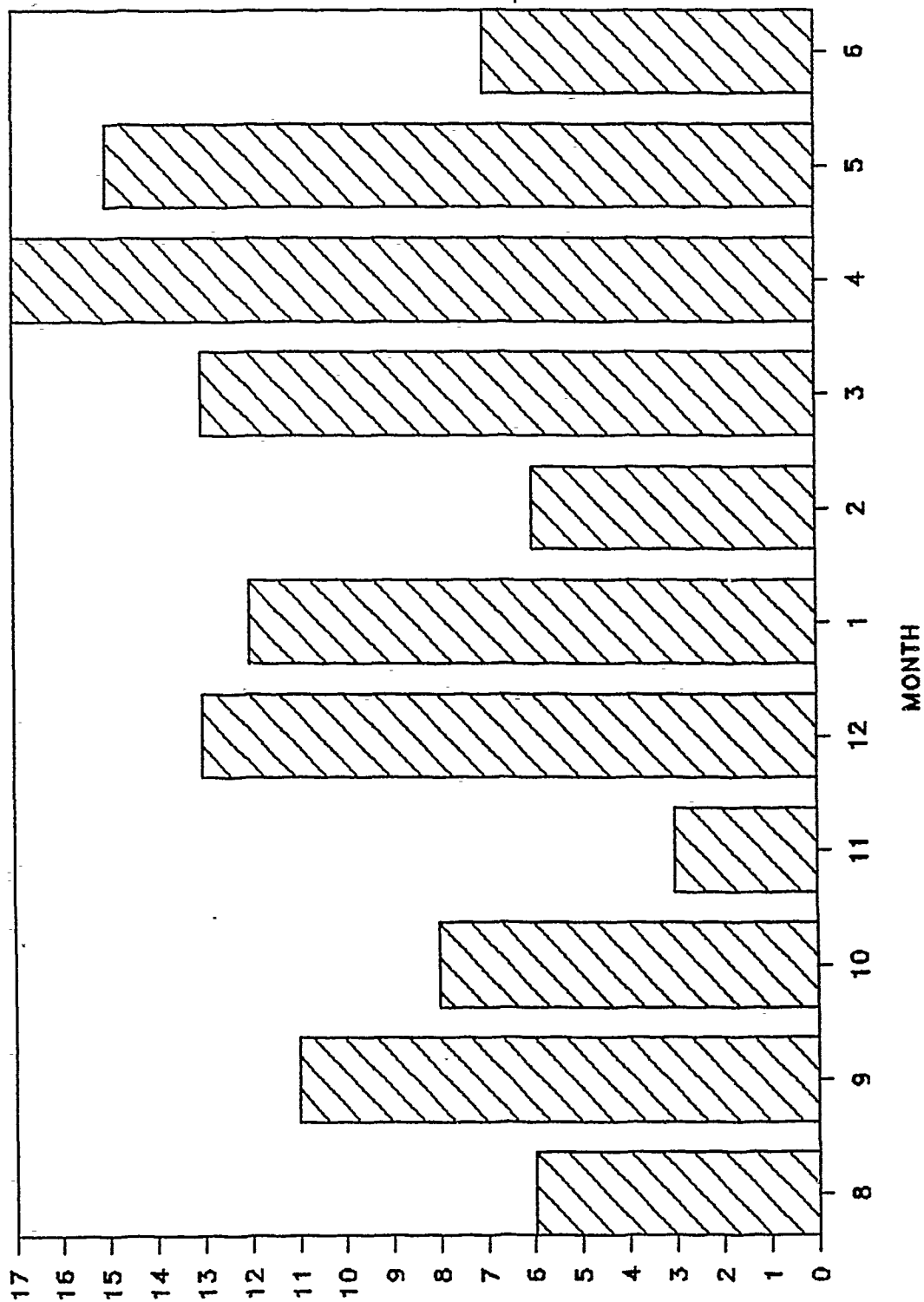
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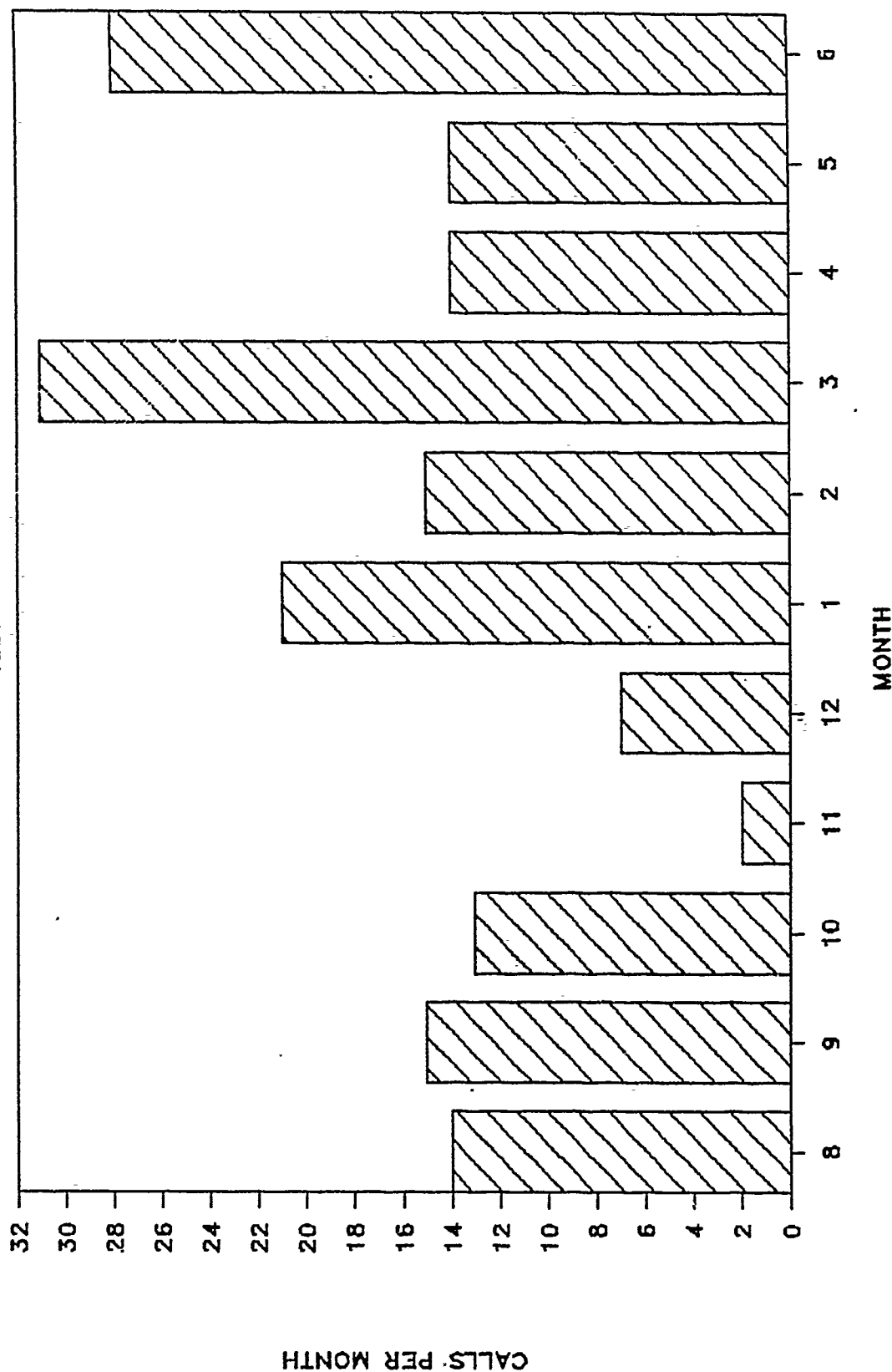


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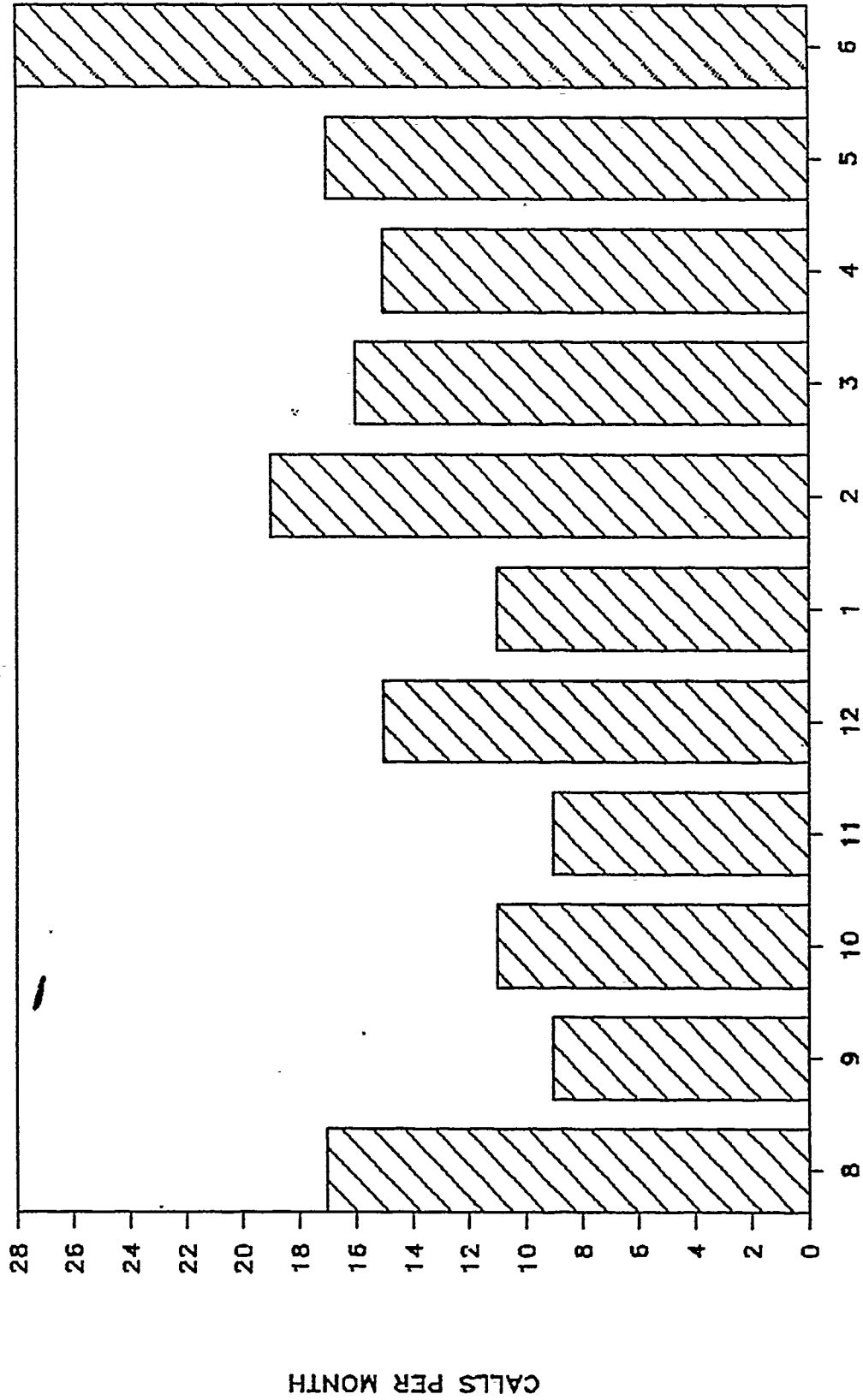
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980060

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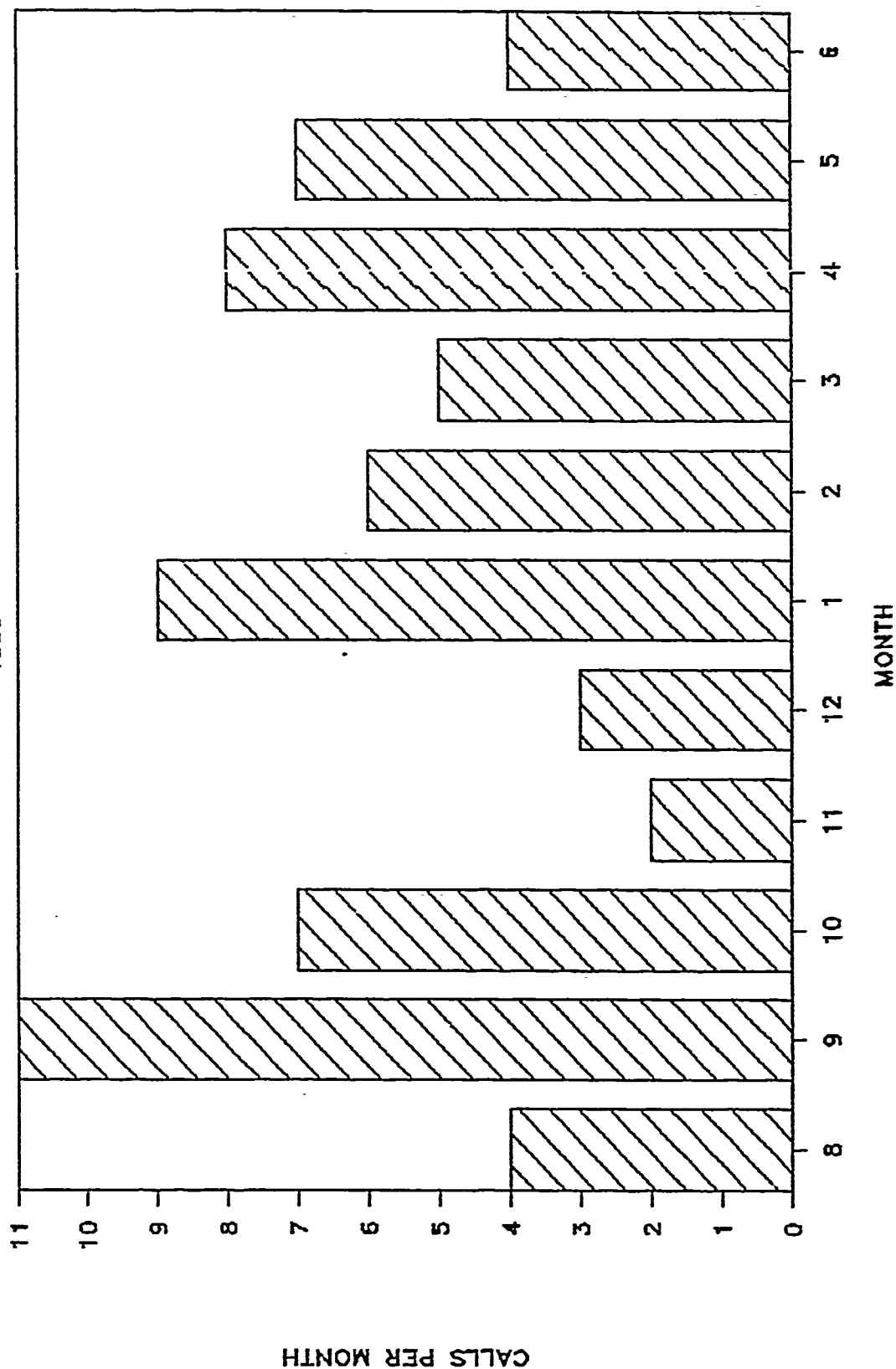
MONTH

CALLS PER MONTH

183

MAINT. CALLS (1989/90)

4359

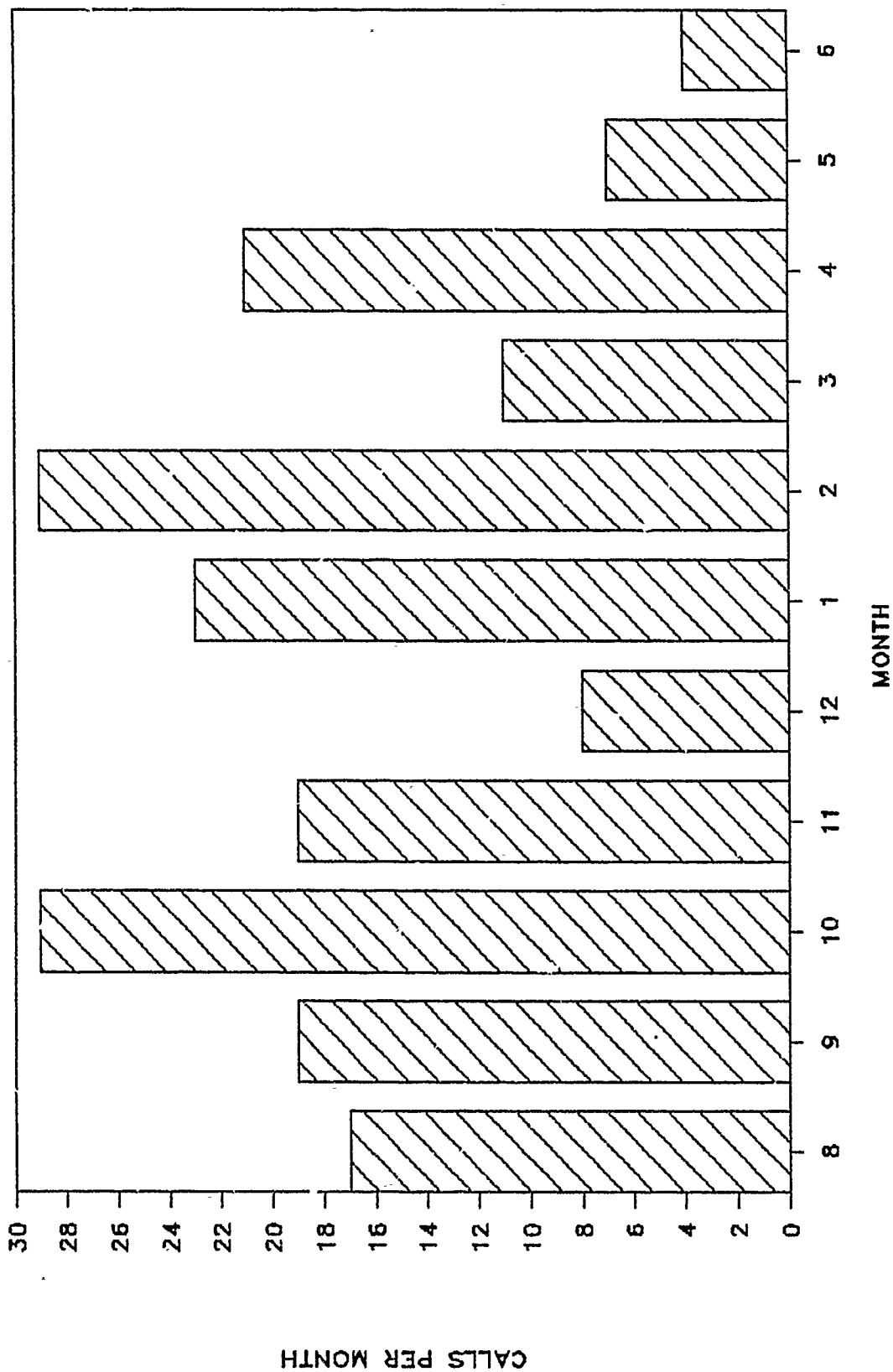


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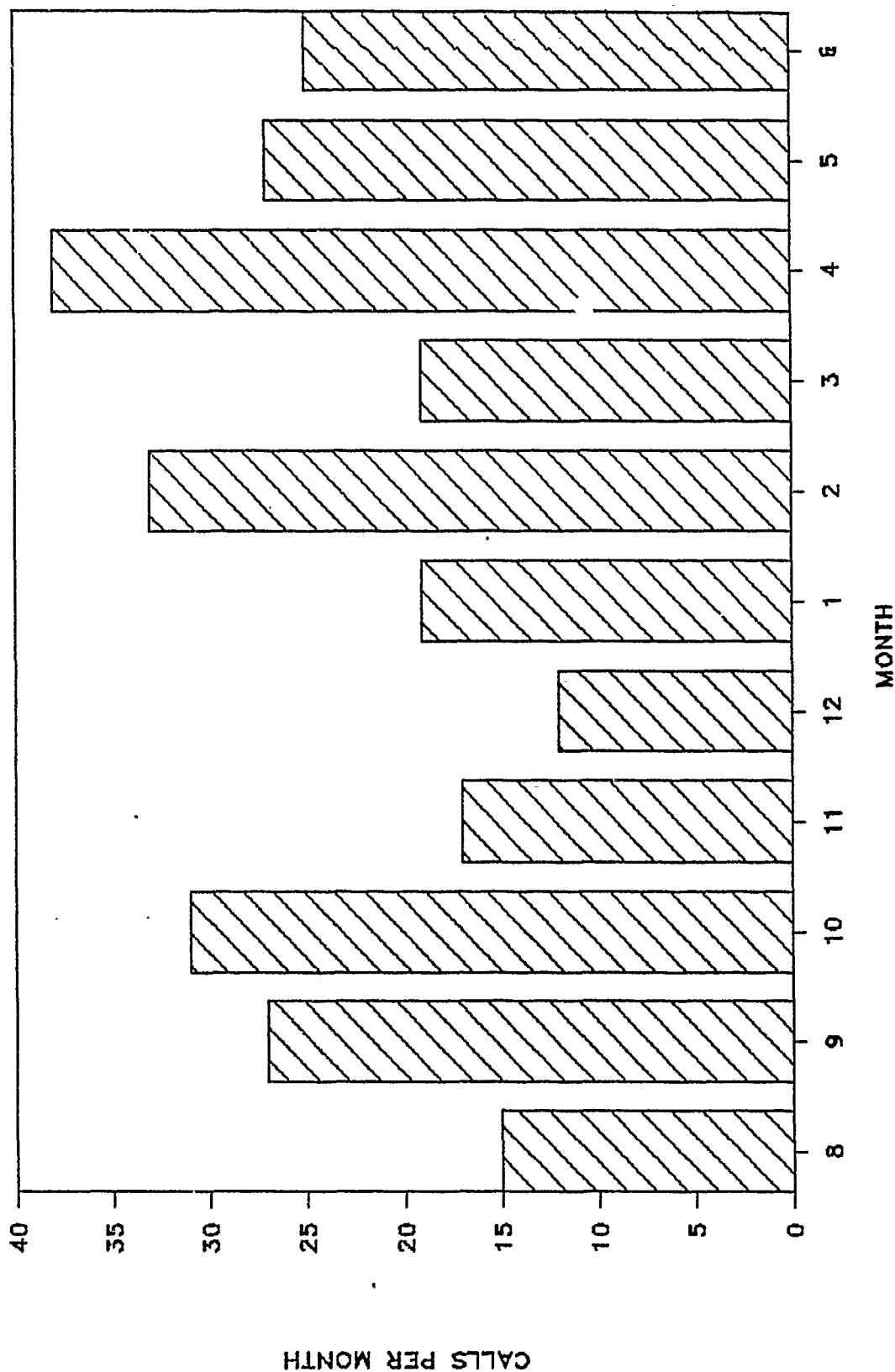
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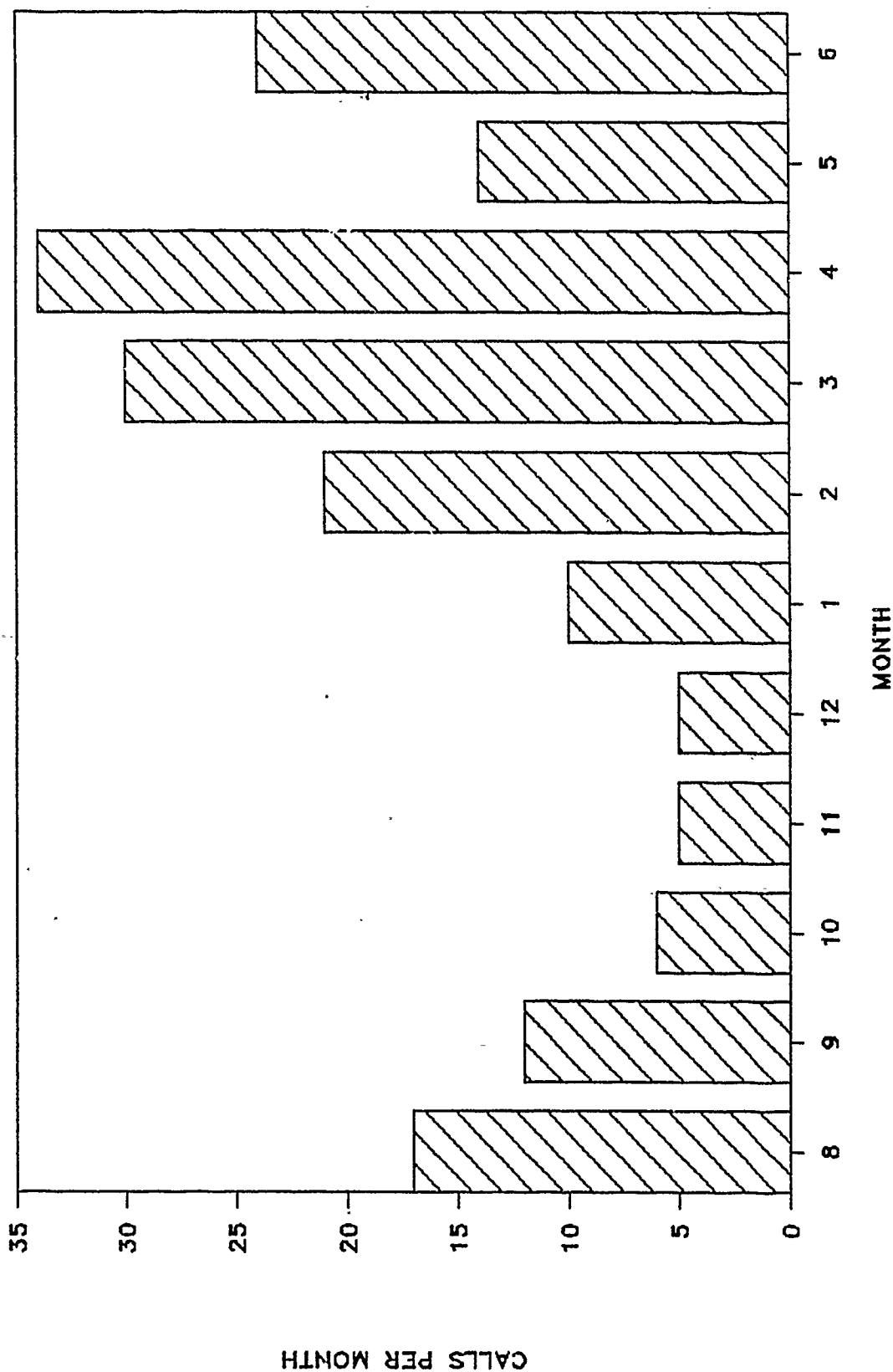
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030060

MAINT. CALLS (1989/90)

4362



EMPLOYEE Baumgardner DATE 28 Sept 90 PAGE NO. 1

RCC ~~The civilian industry~~ has a low spare rate of major units. The goal for the major maintenance bases is to keep the units in the field - working. This is accomplished in two ways:

- 1) Make sure the units are ACTUALLY REPAIRED SO THAT THE RETURN RATE IS LOW AND THAT THE TIME COMPLIANCE REQUIREMENTS UNTIL THE NEXT TEARDOWN ARE HIGH;
- 2) Move the units through the shop AS FAST AS POSSIBLE.

A problem that the civilian industry deals with regularly is LACK OF MONEY to spend on maintenance...the goal being TO DO THE BEST POSSIBLE JOB AND STILL SAVE MONEY. THE WAY TO REACH THIS GOAL IS TO WORK EFFICIENTLY AND COST-EFFECTIVELY.

THE MILITARY IS NOW BEING FACED WITH BUDGET CRUNCHES, WHICH WILL ONLY GET WORSE AS THE YEARS GO ON.

The age-old system, which includes deep pockets and loose accountability standards, will not work anymore. THERE IS A NEED TO CHANGE THE PROCESS and, in some cases, THE BASIC WAY OF THINKING. The budget of the future will create a necessity to be more efficient and to keep spares in the field...rather than having to buy new UFCs "as an emergency."

Specifically, it is necessary to have an accurate plan for each repair shop to follow. Technical data must reflect daily operations according to military rules and regulations. There is no way the UFC shop should be operating with tech data that has little, if anything, to do with the way they are actually doing business. There is, indeed, a major difference between on-condition maintenance and complete overhaul or even "return to specifications."

The civilian industry must report to the FAA, so (by law) airlines and third-party maintenance organizations have clear-cut regulations to follow. These maintenance documents are blessed by the FAA, and are also the documents to which their actual practices are compared during inspections.

In order to make sure that shops are adhering to the established technical data (this is assuming that correct tech data WILL be written), there must also be random inspections done at various points in the process BY SOMEONE OUTSIDE THE SHOP'S CHAIN OF

DDB SEC COM AND

DDB PAGE NO.

030031

EMPLOYEE Baumgardner DATE 28 Sept 90 PAGE NO. 2RCC Individual parts must be tracked all the way through the process.

This should include notating what was done to the part. **BAR CODING**, as part of a computerized tracking system, IS AN EASY WAY TO IMPLEMENT SUCH A PROCESS.

Having this kind of indepth history available will also make it easier to do the research necessary to solve the quality problem. According to records, the amount of time in the field between depot-level maintenance visits is about 1/3 of Bendix's predictions: 600 hours instead of 1800! Some of this deviation may be due to optimistic expectations on the part of Bendix; however, those kind of statistics would not be tolerated in the civilian industry.

A study needs to be done together with the vendor. New procedures should be written to detail how the process actually works, and then realistic statistics for the units should be calculated. Given the current data, it would seem that time-compliance tasks should be adjusted to accommodate the high failure rate in the field.

The absence of applicable tech data more than likely has a direct relation to the high number of UFCs coming back with failures so soon after repair. This problem goes deeper than "HIGH INFANT MORTALITY RATES." This also suggests that there is not enough separation between Q.C. personnel and the Production Department.

CLEARLY, IT IS IMPOSSIBLE TO PINPOINT PROBLEMS IN THE PROCESS OF A SHOP (OR THE QUALITY OF WORK PUT OUT) IF THERE IS NOT A PARTS ACCOUNTIBILITY PROGRAM, NOR A SERIOUS QUALITY CONTROL PLAN.

On-Condition Maintenance (OCM) programs have been established by many of the airlines - and then abolished. One of the reasons for this is that units were not able to remain in the field as long before being brought in for another problem or a time-compliance inspection. OCM works much better in the airframe department than in the engine department.

Actually, an OCM program might work efficiently for the Air Force because of the huge inventory of spares...if it is possible to get the majority of the inventory out in the field, working. I do not have exact numbers, but I do know that the USAF's inventory (spare level) is substantially higher than the civilian industry's. On the other hand, the percentage of that inventory that is ACTUALLY FUNCTIONING IN THE FIELD IS WAY TOO LOW.

UDB SECTION CODE _____

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030092

ENGINEERING NOTES

191

EMPLOYEE Baumgardner DATE 28 Sept 90 PAGE NO. 3
RCC MATPFA SUBJECT General overviews

FOR THE PRICE OF ALL THESE REPAIRABLE ASSETS, THE AIR FORCE
COULD BUY _____! (Pick something that
everyone can relate to longingly) X # of BMWs?

The current OCM team is moving in the right direction towards creating a functional data base for the UFCs. It is still impossible to have an accurate history of each UFC if there is only information regarding the *type* of previous write-up, but with no data about what was done to repair said item.

Plans & Scheduling should start the process on each UFC to be inducted by checking its history before it is released by DS. But, how can Production be prepared to handle recurring problems if there are no systems in place to actually "track incoming repairable assets by serial number?" (Nadeau, Jul 90)

In the civilian industry, the Planning Department takes an active role in accountability, parts tracking and workflow. Call it what you will, there is no tolerance for working "easier" jobs first or putting off particular jobs because of "parts availability." Workflow is established in planning; deviations must be explained by floor managers.

In the Plans & Scheduling Departments of civilian companies, there is limited technical training, but these personnel CAN, AND DO, differentiate between various components and parts. This is learned by studying pictures of units shown torn down, as well as from spending time out on the floor tracking part numbers during required "random checks."

Procurement of necessary parts to keep units flowing through in a timely manner should be a priority. Inventory should not be "frozen" unless it is an absolute emergency; most companies had never heard of that happening - ever! When parts availability becomes a problem, yet the parts are actually in the hands of the company (in this case, the Air Force's distribution center, "DS",) the system needs to be changed.

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030093

ENGINEERING NOTES

192

EMPLOYEE BaumgardnerDATE 28 Sept 90PAGE NO. 4RCC MA/FAASUBJECT General Overview

I also suspect there may be some problem in the way that "pending parts waiting" items are handled by MIC. Because a desk drawer is used as a pending file, it is possible that suspense items are not checked on for a "re-request" often enough. (One has a tendency not to flip through lots of little pieces of paper on a daily basis when other work takes the attention.) Since the Air Force has computer capability, it would be a good idea to transfer the suspense or pending files to a computer program - perhaps the Tracker II program could accommodate this.

Once new procedures documentation is written, there is another area which will become easier to manage: Training of new personnel.

For the airlines and 3rd-party companies, the FAA requires complete training records be kept on each mechanic. This has prompted these civilian organizations to develop detailed training programs over the years. A single mentor (or the last person to fill that slot) does not have to be attached to the new employee because the supervisor can assign different people to train and sign-off each task.

There are many ways to increase productivity and quality. But in order for these new ideas to take hold, upper management must make the changes. Decisions will have to be made to try the experimentation necessary to pinpoint the big problems in the system. Parts accountability and the creation of an accurate manual for current maintenance practices are the two places to begin solving the problems.

Being accountable, by having procedures and tracking methods, will undoubtedly make some people within the system very nervous. Such a system will show quite quickly where flaws in the process are hidden.

Unfortunately, if the low spare rate in the field is ever to be brought up to an acceptable amount, and the quality of those spares is to be increased, an accountability method will have to be established.

Question: How can one be sure that increased production rates and lowered flowtime and WIP levels are not due to a large # of units that had been WIP for months which finally came through during this period of time?

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000034

4.0

WORK FORCE

provided by ocm Team

UNIFIED FUEL CONTROL PRODUCT

VIA ON-CONDITION MAINTENANCE

1. ON-CONDITION MAINTENANCE, (OCM), IN SIMPLE TERMS IS "FIX WHAT'S BROKE". SINCE IT IS VERY IMPORTANT TO KNOW THE HISTORY OF A CONTROL, MUCH AS A PHYSICIAN'S PATIENT FILE, A DATA BASE CONTAINING THE HISTORY OF EVERY UFC WORKED AT SA-ALC/MATFF IS MAINTAINED IN THE OCM TEAM OFFICE. THERE UPON RECEIPT OF A REPARABLE ASSET, THE OCM TEAM REVIEWS THAT HISTORY FILE TO DETERMINE IF THE UFC WILL REQUIRE SPECIAL ATTENTION IN THE FORM OF INDUCTION INTO THE "SPECIAL INVESTIGATION TEAM", (SIT), SUCH AS CONTROLS THAT DO NOT HAVE A DELTA TIME OF AT LEAST 50 OPERATING HOURS, OR DISPLAY A CHRONIC PROBLEM THAT HAS NOT BEEN DUPLICATED AT THE DEPOT. THE HISTORY ALSO PROVIDES THE OCM TEAM WITH THE PRESENT CONFIGURATION AND ASSISTS IN DETERMINING THE REQUIRED TOTO INCORPORATIONS REQUIRE DURING THIS DEPOT VISIT.
2. FOLLOWING THE HISTORY REVIEW, THE CONTROL UNDERGOES EXTERNAL CLEANING, AND "AS RECEIVED INSPECTION". THIS INCLUDES BUT IS NOT LIMITED TO EXTERNAL VISUAL INSPECTION STATIC ELECTRICAL CHECK, CONTAMINATION CHECK, AND HANDS-ON INSPECTION TO IDENTIFY AS TO WHICH MODIFICATIONS HAVE BEEN PREVIOUSLY ACCOMPLISHED.
3. RAR OR (RUN AS RECEIVED) IS PERFORMED AS A DIAGNOSIS FOLLOWING THE AS RECEIVED INSPECTION. TEST PARAGRAPHS RELATED TO THE REPORTED ENGINE MALFUNCTION ARE PERFORMED IN ORDER TO DUPLICATE THE CUSTOMER'S COMPLAINT. A A LOCALLY DEVELOPED RAR, (SA-ALC RAR) IS PERFORMED AS A HEALTH CHECK THAT FUNCTIONALLY TESTS ALL SYSTEMS OF THE UFC. THIS HEALTH PROVIDES THE OCM TEAM WITH A GOOD LOOK AT THE INTEGRITY OF THE ENTIRE CONTROL AND AFFORDS THE THE TOOL TO MAKE A REPAIR DIRECTION WITH MINIMAL DELAYS AND/OR BACKTRACKING. IT FURTHER ALLOWS THE TEAM TO IDENTIFY PROBLEMS NOT IDENTIFIED BY THE FIELD BUT WOULD LIMIT THE MEAN TIME BETWEEN UNSCHEDULED REMOVAL, (MTEBR), SUCH AS BORDERLINE FUEL FLOWS, ELECTRICAL COMPONENT FUNCTIONAL RESPONSE, ETC..
4. USING THE ABOVE DATA THE OCM TEAM MAKES THE DIRECTION OF WORK WHICH COULD RANGE FROM "MINOR ADJUSTMENTS" TO "LAST NUT AND BOLT". THE CONTROLS MIGHT BE REPAIRED ON THE

050061

TEST STAND OR REMOVED FROM THE TEST STAND FOR REPAIR/MODIFICATION. FOLLOW-UP INSTRUCTIONS ARE PROVIDED THROUGHOUT THE ENTIRE PROCESS AS NECESSARY.

5. AFTER MAKING THE TREK THROUGH THE REPAIR PROCESS, A FINAL LOOK AT THE COMPLETED WCD, (WORK CONTROL DOCUMENTS) IS PERFORMED TO ASSURE THAT ALL WORK AND MODIFICATIONS DUE DURING THIS VISIT WERE IN FACT ACCOMPLISHED AND THAT THE IDENTIFICATION PLATE REFLECTS THESE ACCOMPLISHMENTS. IN ADDITION, DATA GLEANED FROM THE COMPLETED WCDs AND STORED IN THE OCM TEAM'S DATA BASE AS WELL AS INPUT IN TO CEMS, (CONSOLIDATED ENGINE MANAGEMENT SYSTEM), IN THE FORM OF AN AFTO FORM 95, "SIGNIFICANT HISTORICAL DATA". THIS ASSISTS THE FIELD IN RECOGNIZING THE HISTORY OF THE CONTROL AND ANSWERS, FOR THE MOST PART, WHAT WAS DONE TO UFC DURING IT'S LAST DEPOT VISIT.
6. PLEASE NOTE THAT THIS IS JUST A BRIEF SUMMARY OF THE REPAIR PROCESS OF THE UFC. PRIORITIES OF THE REPAIR PROCESS CHANGE RAPIDLY AND AT LEAST DAILY. FOR ANY FURTHER INFORMATION POINT OF CONTACT IS FRANK A. MANN, MATPF, OCM TEAM CHAIRMAN, 54491.

050002

Assuming Training Class Continues (14 PEs)

Month	Reg	OT	%	Reg	OT %
Jan	21744.9	4071.9	18.7%	34701	11.7%
Feb	19583.1	4178.9	21.3%	30349	13.8%
Mar	22134.0	4220.5	19.1%	33394	12.6%
Apr	20393.0	4052.2	19.9%	31599	12.8%
May	19827.2	3857.2	19.5%	34295	11.2%
Jun	17953.2	5278.6	29.4%	31973	16.5%
Jul	15958.2	5284.6	33.1%	33268	15.9%
Total	137593.6	30943.9	22.5%	229579	13.479%

Model PEs

Repair	60	38
Testing	73	48

Work Days	5	2
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Man-days/Week

Repair	300	76	
Testing	364	96	
Total	664	172	25.9%

Multiplier	345.9	179.9
------------	-------	-------

Targets:	2%	4592
	5%	11480

Same	2%	5%
------	----	----

New Mandays	664	26	64
-------------	-----	----	----

New Model PEs	133	13	32
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OT Ratio

WG 00	44.2%	6	14
WG 09	3.5%	1	1
WG 10	18.6%	2	6
WG 11	33.7%	4	11
WG SW	0.0%	0	0

Levelled	50002s	Heavy	
3	8	0	3
1	4	0	0
1	4	0	0
8	16	13	29
0	0	0	0

049001

MATPF
ADAN SOSA

MATPFA
ANTONIO PEREZ
1st SHIFT 108

MATPFA
GUADALUPE SAUCEDA
2nd & 3rd SHIFT 77

F100 UFC TEST
GONZALEZ, EMILIO
WG11-10
WG10-3
WG09-1
15

F100 UFC TEST
PADILLA, REMUNDO
WG11-11
WG10-1
WG09-1
14

F100 UFC TEST
SERENIL, ISREAL
WG11-6
WG10-7
WG09-2
18

F100 UFC TEST,
O/H & OCM
BRASUELL, WILLIAM
WG11-10
WG10-6
WG09-2
WG07-1
2nd SHIFT 20

F100 UFC O/H
PELAYO, LOUIS
WL10-1
WG10-4
WG09-2
WG07-1
9

F100 UFC O/H.
CANO, FELIPE
WG11-1
WG10-11
WG09-7
WG07-1
WG05-2
23

F100 UFC O/H
CARROLL, MARK
WG11-1
WG10-1
WG09-3
WG07-6
WG05-1
13

F100 UFC TEST
& SAFETY WIRE
SAIZ, RONNIE
WG11-9
WG10-7
WG09-1
WG07-2
2nd SHIFT 20

F100 UFC
(TRAINING)
HUERTA, ALBERT
WL10-1
WT10-14
16

F100 UFC TEST
PALMER, ROBERT
WG11-12
3rd SHIFT 13

F100 UFC TEST
GONZALES, DANIEL
WG11-7
WG10-3
WG09-1
3rd SHIFT 12

F100 UFC O/H,
OCM & SAFETY WIRE
MORA, DENNIS
WG10-4
WG09-4
WG07-1
WG05-1
3rd SHIFT 11

040002

ENGINEERING NOTES

EMPLOYEE P. Parker DATE 6/25/90 PAGE NO. 1
RCC MATPFA SUBJECT Manpower

6/25/90 - Monday

Susan Schattle provided me with information she obtained pertaining to manpower utilization. The data is contained on several printouts which list the RCC's personnel roster by name, as well as the total hours worked, and the various tasks they performed for the month of May. Ms. Henderson provided me with a data sheet which provides the task description codes which are necessary to interpret these data sheets. Unfortunately, we need a specific breakdown of how much each worker in the RCC charged to the major task codes. This data is not contained on any of the sheets which we have obtained so far. Ms. Schattle's contact in MAW for this data is Yolonda Makum, ext 56201. Yolonda has said that she can provide this data at the end of this month. Apparently, she only has access to this information for the current month, the files then being assimilated into other, more general databases. This data is obtained in its base form from the time sheets turned in by the first line supervisors. While I am sure that there are several reports which may list the RCC's manpower availability, Ms. Henderson has asked us to obtain more detailed information for this RCC. This is due to her concern that the available ALC reports may not be accurate in their representation of tasks performed in this RCC. Examples of the above data sheets and various reports are herein included, and are identified with the designator "A".

Ms. Henderson will make an appointment for she and I to meet Jim Grounds tomorrow afternoon. Mr. Grounds is in charge of the Equipment Maintenance area, which is responsible for maintaining and repairing the UFC testing equipment. We will also speak with Roy Evans, who tracks much of the repair data for this equipment.

DDB SECTION CODE 4.0

DDB PAGE NO. _____

040003

ENGINEERING NOTES

36

EMPLOYEE

P. Parker

DATE

7/2/90

PAGE NO.

5--

RCC

MATPFA

SUBJECT

manpower

7/2/90 - Monday

Mr. Gardner, Mr. Premo, and I went to see Mr. Grounds this afternoon. Mr. Grounds discussed his function in overseeing the equipment maintenance section in more detail than during our previous visit. He also answered some general questions relating to the data which we have collected on machine failures and downtime. Mr. Premo has taken responsibility for the analysis of this data, and will prepare the reports for our test stand specialist, as well as any conclusions to be entered into the DDB or CSR.

I have examined the data which we obtained from Yolonda, relating to manpower utilization and availability (see attached example sheets, designated "D"). I am going to have to contact her for instructions on how to use these printouts. It appears that they are mostly exceptions lists and total hours worked. While these may be what I need to input the manpower and skill data into the resource files for model use, I am unable to interpret these reports to extract the needed data.

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DDB PAGE NO.

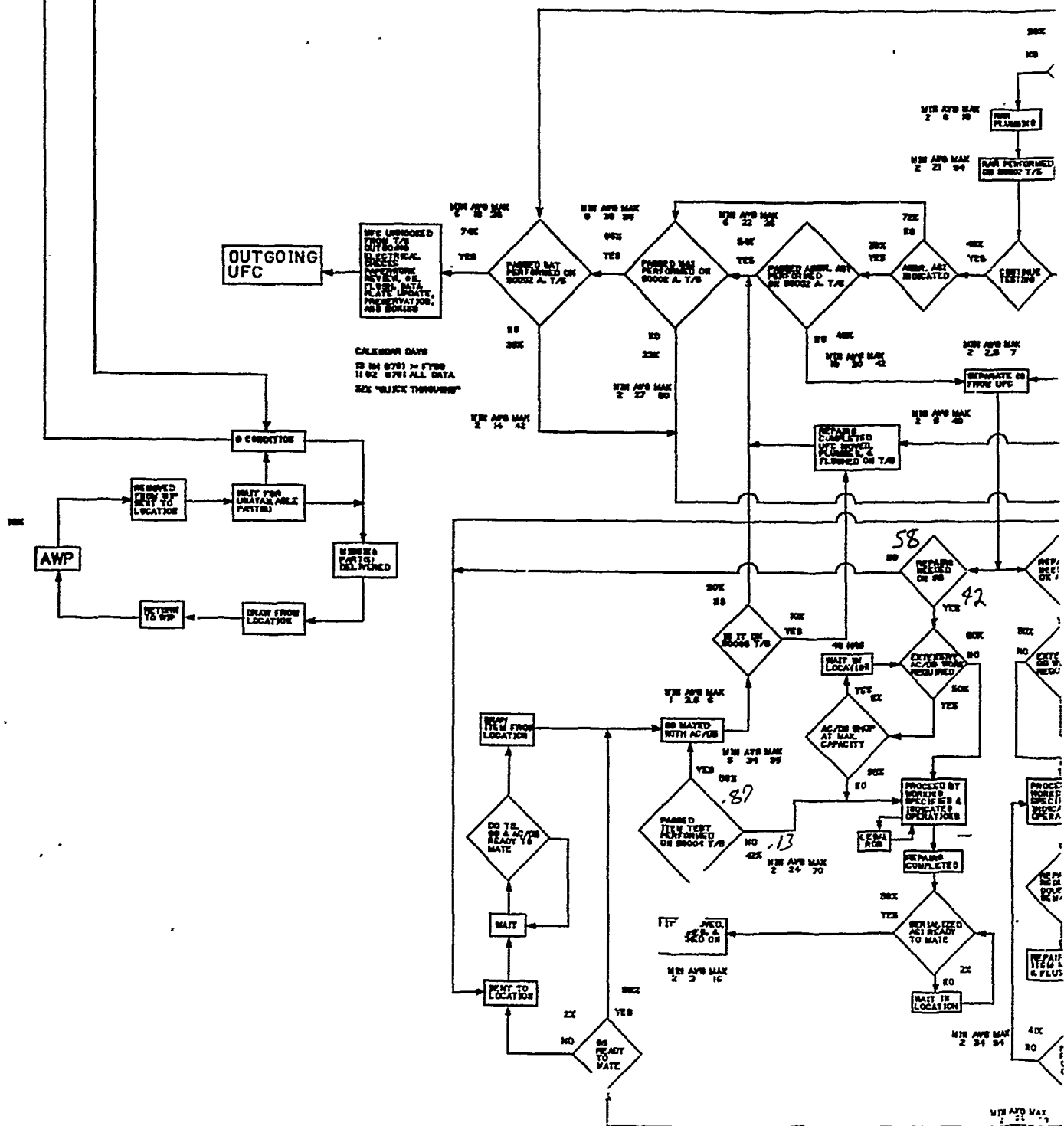
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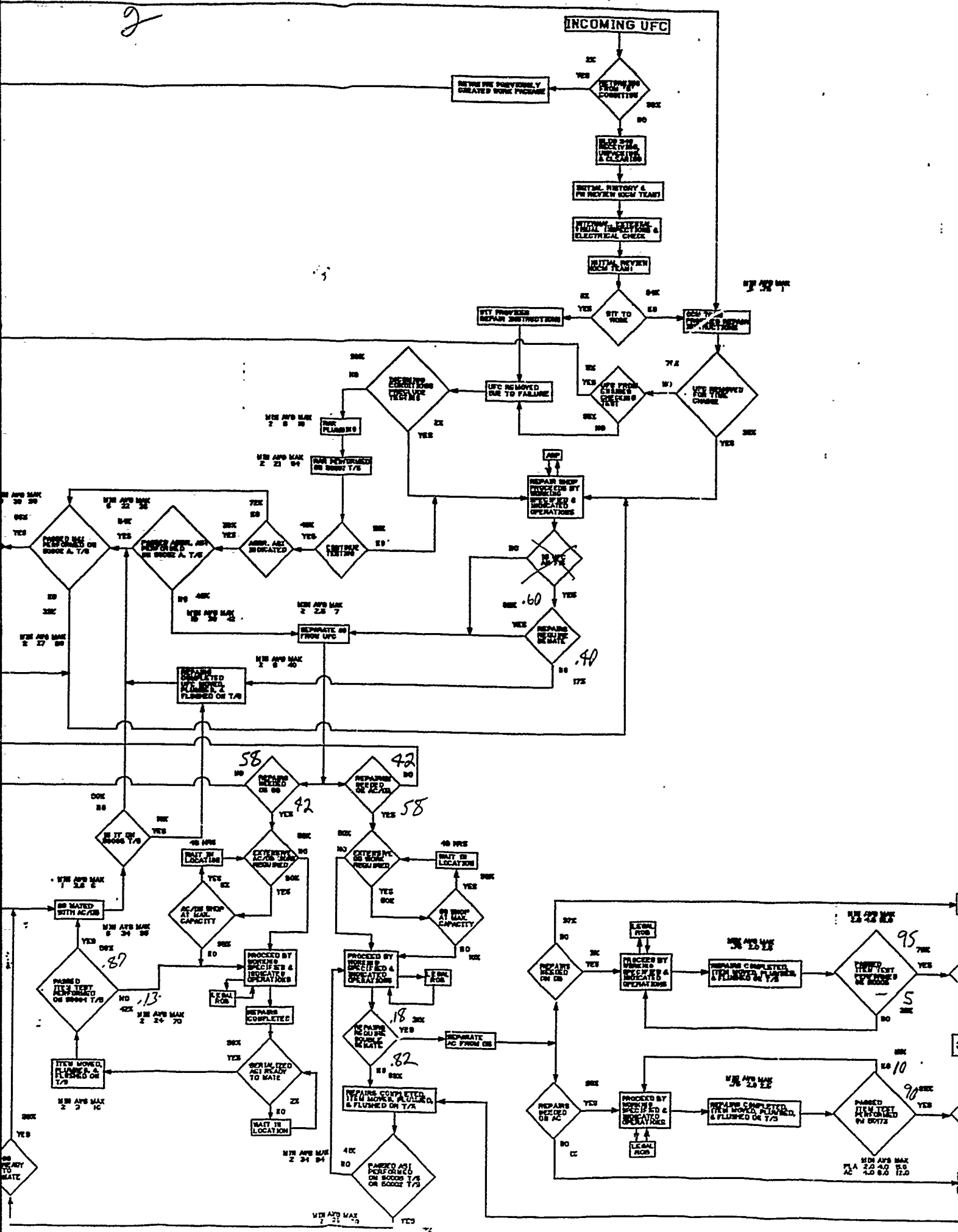
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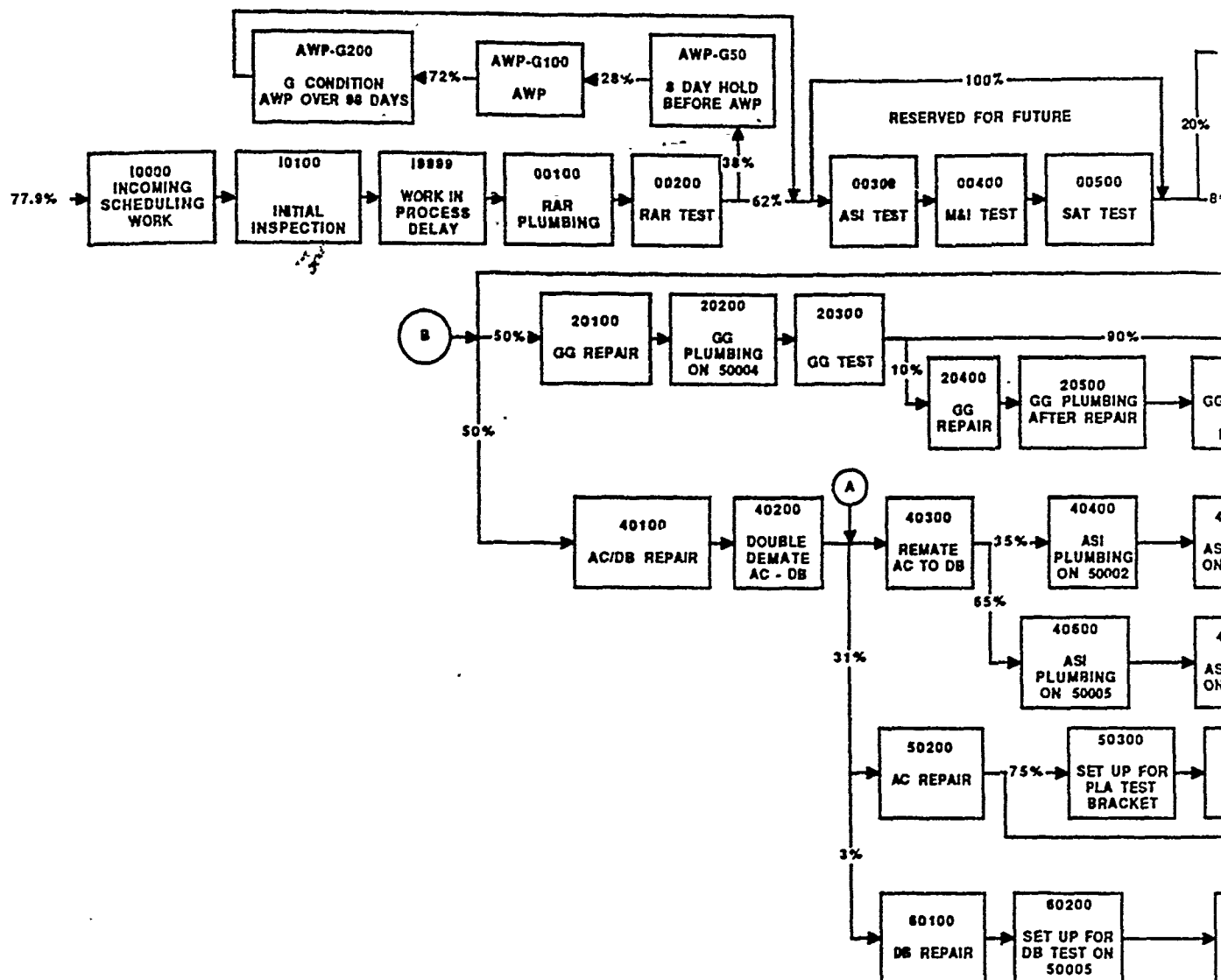
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TECHNOLOGY

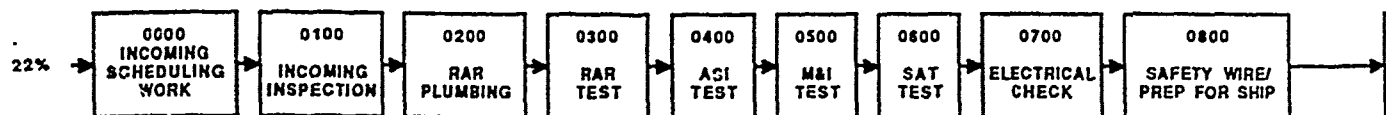




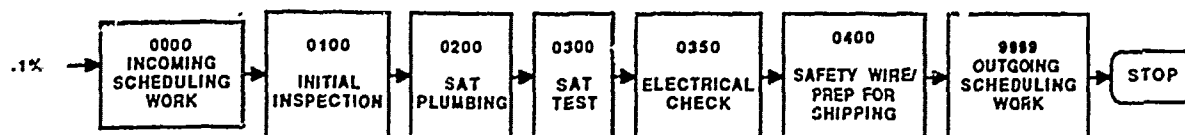
F-15 SLOTHRU



UFC QUICKTHRU

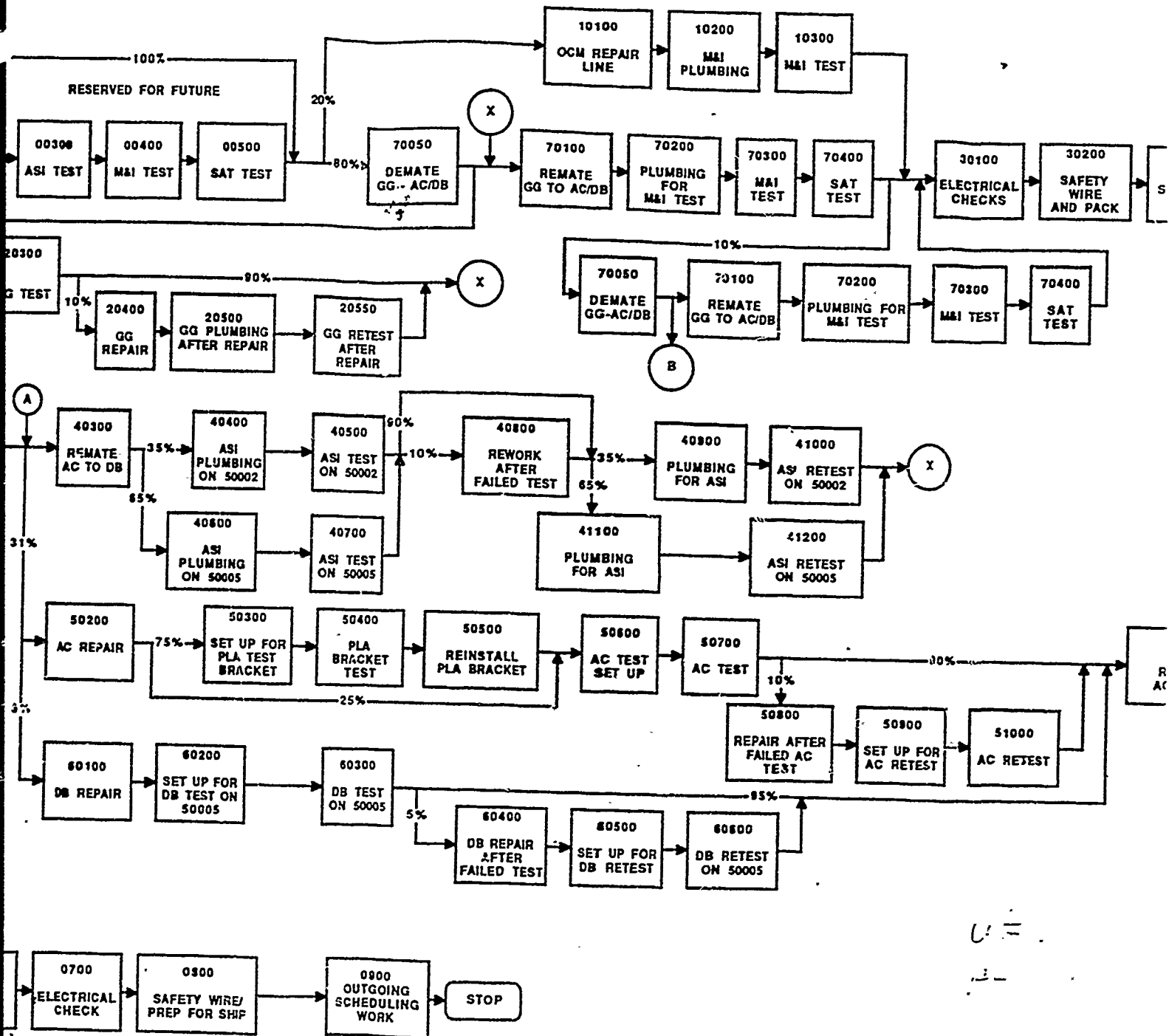


SUPERQUICK THRU



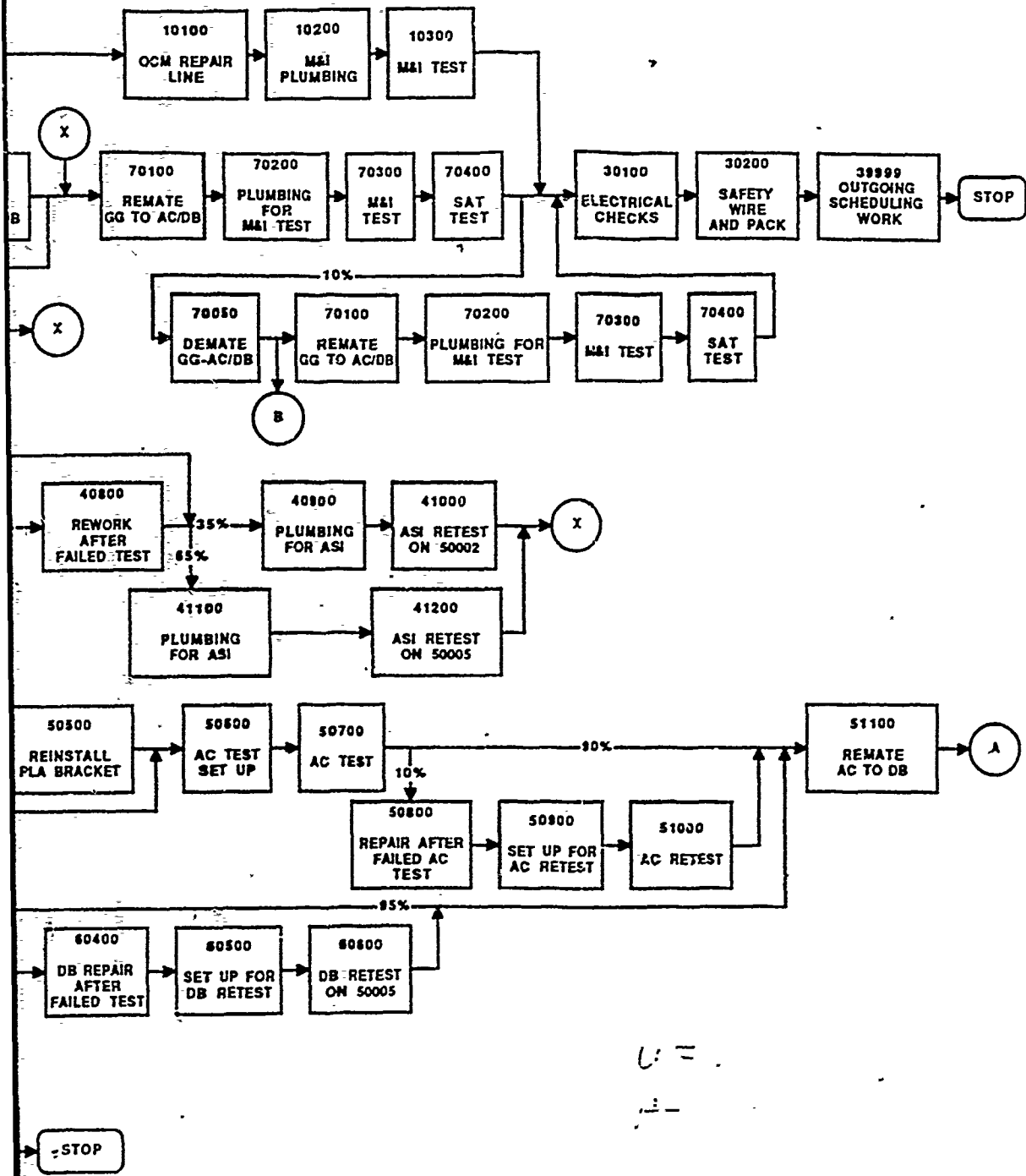
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F-15 SLOTHRU



KEY
X###
X = WCD NUMBER
= OPERATION NUMBER

Day
3



KEY
XXXXX
= WCD NUMBER
OPERATION NUMBER

20821

050004

TC R

** WCD DATA BASE **

10 MAY 1990

✓ TC001R 88242 BELLOWS ASSY TRANSDUCER
 X TC002R 88242 UNIFIED FUEL CONTROL
 ✓ TC003R 88242 GAS GENERATOR COVER ASSY
 ✓ TC004R 88242 GAS GENERATOR COMPUTER
 ✓ TC005R 88242 GAS GENERATOR BODY ASSY
 ✓ TC006R 88242 SPEED RECEIVER ASSEMBLY
 ✓ TC007R 88242 CUTOFF VALVE SERVO BODY ASSY
 ✓ TC008R 88242 UFC DCM CMTR I
 ✓ TC009R 88242 UNIFIED FUEL CONTROL/CMTR II
 ✓ TC00WR 39087 UNIFIED FUEL CONTROL
 ✓ TC00XR 89060 GAS GENERATOR CONTROL ASSEMBLY
 ✓ TC00YR 88242 AUGMENTOR COMPUTER ASSEMBLY
 ✓ TC00ZR 89013 AUGMENTOR DISTRIBUTION ASSY
 X TC010R 88242 UNIFIED FUEL CONTROL/CMTR III
 X TC011R 88242 UNIFIED FUEL CONTROL/CMTR IV
 ✓ TC012R 88242 VALVE AND COVER ASSEMBLY
 ✓ TC013R 88242 STEPPER MOTORS & SOLENOIDS
 ✓ TC014R 89283 IGNITION WIRING HARNESS
 ✓ TC015R 88242 LOGIC BRACKET ASSY
 ✓ TC016R 88242 TRIM CENTERING BRACKET ASSY
 ✓ TC017R 88242 MANIFOLD FILL SENSOR ASSY
 ✓ TC018R 88242 HEAD SENSOR & BELLOWS ASSY
 ✓ TC019R 88242 AUGMENTOR ROTARY ACTUATOR ASSY
 ✓ TC020R 88242 SEQUENCING VALVE ASSEMBLY
 ✓ TC021R 88242 GAS GENERATOR METERING ASSY
 X TC022R 88242 OUTPUT BODY ASSEMBLY
 ✓ TC023R 88242 RATIO BRACKET ASSEMBLY
 ✓ TC024R 88242 PLA BRACKET ASSEMBLY
 X TC025R 88242 AJ LINK BRACKET ASSY
 X TC026R 88242 TEMPERATURE RECEIVER ASSY
 ✓ TC027R 88242 PB ACTUATOR ASSEMBLY
 ✓ TC028R 88242 SWITCHES & RESOLVERS WIRING
 ✓ TC029R 88242 IGN TIMER BODY & PISTON ASSY
 ✓ TC030R 88242 FLOW DIVIDER VALVE ASSY
 X TC031R 88288 AUG INLET FILTER SLEEVE ASSY
 X TC032R 88288 GAS GENERATOR INLET FILTER
 ✓ TC033R 88242 METERING VALVE PLATE ASSEMBLY
 X TC034R 90051 SHAFT ASSEMBLY
 X TC035R 88242 AUG INLET FILTER ASSY
 ✓ TC036R 88242 RCVV VALVE ASSEMBLY
 ✓ TC037R 88242 F-100 UNIFIED FUEL CTRL (-532)
 ✓ TC038R 88242 VALVE & SLEEVE ASSY
 ✓ TC039R 88242 PRESSURIZING VALVE ASSY
 ✓ TC040R 89244 BODY ASSY RE ACTUATOR
 X TC041R 90101 INSPECTION CHECKLIST (F-100)
 ✓ TC077R 88280 *IMPELLER LAPPING
 ✓ TC109R 89236 *PUMP (B-52H)
 X TC690R 89033 SHAFT, GOVERNOR CAM
 ✓ TCN20R 89299 N2 SHAFT
 ✓ TCDCMR 89348 UFC FLAMEOUT, THRUST LOSS/
 51 ✓ TC050R valve servo metering valve

Listing of WCDs
 in UFC area.

050005

EMPLOYEE LKB
RCC _____DATE 2/4/ PAGE NO. 1/31
SUBJECT T.O. 16 - Major topics

Information Systems:

Most of the major airlines and 3rd party mx. companies have computer programs developed for parts tracking - developed within the last five years, except for a few industry leaders.

Many are using bar-coding for tracking. This carries over into job tracking, labor tracking and record-keeping of historical data.

American Airlines has 2 computer programs for use in mx. area; one for ordering/tracking parts and one for tracking manhours on jobs. All of these are linked to their "SABER" system, a mainframe which now encompasses 7 different programs.

Northwest Airlines uses "SEPTRE II", a program created several years ago for Republic Airlines. When the 2 airlines merged 4 years ago, Northwest was brought online. This system is one of the best - every part w/ a serial # can be traced throughout the teardown/buildup process, as well as easily pull up history on said part.

United Airlines uses "cosmo" and is currently updating this to "cosmo II". Bar coding is used and parts can be tracked & routed easily. Tags are scanned by each mechanic who works w/ the part, unit or module - thus updates are accurately fed into the system & inspectors, workers or whomever can easily find each ~~part~~ item.

Historical data on parts is tracked by computer. In some cases, a limited amount of data is retrieved automatically when an engine first comes off wing. Each module is broken out separately and units/parts can be researched for past rework/inspection.

Often times, a forced entry is then made to pull up history beyond last mx. Some have "current historical" data

EMPLOYEE LKBDATE 241PAGE NO. 2/34

RCC _____

SUBJECT T.O. 16

available on computer, but research-type documentation is kept on microfiche. Records section keeps this info.

Continental Airlines uses SEPTRE II for its mx program. This also serves as a library reference, word cards and historical data on parts. Before beginning work on any module, production meets w/ planning to determine what parts may be needed based on previous work. A heads-up check into inventory will tell them what's available for the job, if necessary. Historical data is also used to track repeat/recurring write-ups. This feeds into the engineering department which, in turn, can update procedures and processes.

Northwest Airlines (Septre II) starts its historical research in Scheduling when an engine is first found to need heavy mx. Basic engine is assigned a serial # from 1st induction into inventory. This serial # is input into the computer, which generates a listing of all modules (also by serial #) and all parts from each module. Here is found (by part) what type & date of last major mx, what engine (if any) the item was ever on before, any major write-ups on the previous engine (FOD, fire, birdstrike, etc) and any hard time requirements.

Delta Airlines uses a new system called "ARC" which is currently under modification (when completed, it will be "MARC"). Although manual in many areas, historical data has been tracked for several years. Since this doesn't integrate with the rest of the system yet, Scheduling must generate reports based on the engine's designated # and then provide these reports to production during the production planning stage.

Collection of performance data is routinely kept by all airlines, as well as the 3rd-party mx facilities. This is done in a variety of ways. The most manual way is to track labor from completed work cards. Materials are generally tracked

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050007

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SUBJECT T.O. 16

through the inventory/supply system. These are all automated/computerized at the airlines. Costs associated with parts and labor are tracked through accounting - often transferred manually to a spreadsheet program. Civilian acft/eng mx operations are extremely cost-conscious and do a good job of tracking this info.

Supply Systems:

Procurement deals w/ ordering parts & supplies. The items bought must meet FAA specs or manufacturers specs depending on what category the item falls under. Inspectors accept the parts upon delivery, before adding to inventory.

Stock level requirements are based primarily on 3 things: lead time for ordering, projected hard time mx requirements and historical usage data.

Storage locations are generally broken down into 2 areas: depot storage and work storage. Both locations are on site, w/ work storage divided into smaller areas based on repair function. A typical mx depot works on large & small acft w/ engines divided accordingly.

Delta has completely automated their central (depot) store w/ a robotics system. It is necessary for someone to manually enter the needed part #, but after that, everything is automated. Once removed from the shelf, the system debits the item. The rest of the storage facilities are run manually on the shop floors.

United has started a new concept in floor (work) storage. Their workers developed work stands, used currently in the build-up department only. Bench stock is still supplied centrally on the floor, but parts delivered for build-up are taken directly to assembly location. The stands are designed to hold all needed parts (~~from~~ nuts & bolts) for each specific job. (picture attached)

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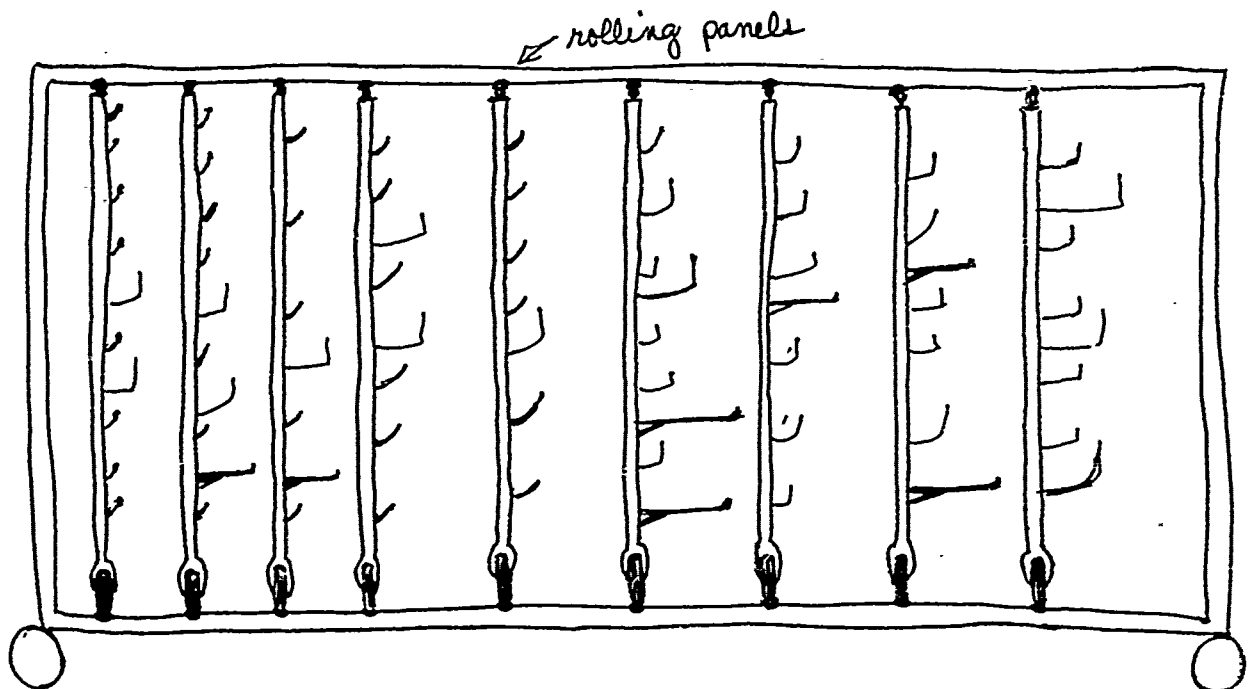
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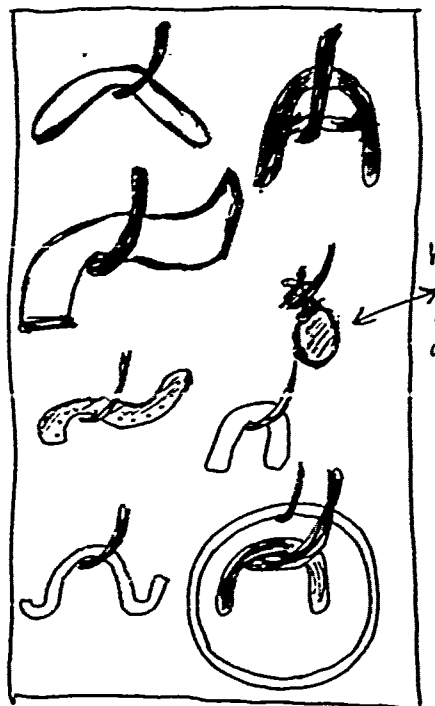
EMPLOYEE LKBDATE 241PAGE NO. ATTACHMENT 1

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SUBJECT _____

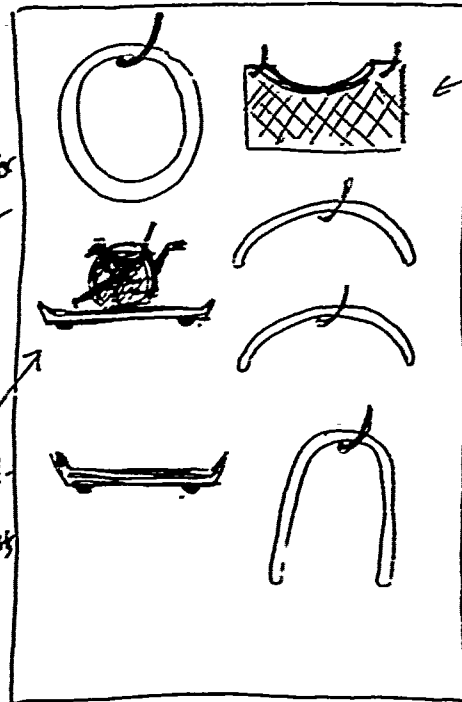


side view



holding bags for
small pieces -
marked appropriately

tray for odd-
shaped
components



BINS
for medium
sized pieces

~ each item needed
for each module
build up is
outlined against
the board or
clearly described
for bins and bags

front view of ~~rolling~~ panelsDDB SECTION CODE 5.0

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050059

ENGINEERING NOTES

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SUBJECT T.O. 16

Ordering procedures vary a little, but for the most part, when stock gets low (minimum on-hand count alerts the main store) the "system" automatically puts in an order through procurement.

Northwest Airlines has the SEPTRE II system which kicks out an order (via modem at the field level) through central stores to procurement. Info on inventory can also be accessed by Plans, Scheduling, Production, Budget & Systems Operations if questions occur on a long-lead time item.

Continental Airlines actually overrides the computer on certain components if a high-breakdown statistics show up. If it looks like a trend, the # in the computer can be altered after a certain period of time. Management is also empowered to bypass Procurement in an emergency. Central Stores has vendor listings and parts can be ordered directly to save time, if necessary.

EMPLOYEE LKBDATE 242PAGE NO. 1/3

RCC _____

SUBJECT T.O. 16 Major Topics

Training:

Most of training done for the shop workers is in the form of O.J.T. It is well-documented due to FAA regulations.

United Airlines is in the process of changing their procedures for O.J.T. from "actual-flow" tasking to "forced-flow" tasking. This means that instead of taking a new worker through the checklist as tasks come up over the first few months, they follow the checklist closely by finding the tasks to complete throughout the shop. It costs a little more up front to train someone that way; but in the long run, the new worker will be able to work without a "guardian" much faster. This frees up qualified trainers and also puts 1, instead of 2 people, on a given job much sooner.

Northwest Airlines used multi-media training, to include some video, some computer and some one-on-one O.J.T. Their shop workers generally take about 3 months to be signed off on everything. The computer training is for their computerized mx tracking. The unique thing is that they actually have a program designed to train the shop workers. Most airlines don't consider this to be part of necessary training for their mechanics. NWA, on the other hand, assume that if one is not trained, input will be erroneous & also the records, reports, etc.

American Airlines does a lot more cross-training than most other airlines. They refer to them as "rotatable", in that they are trained to work in 2 or 3 engine areas, and can be rotated to wherever they are needed. Although all airlines have to document a well-rounded training program by shop, most shops keep people "current" on only one area at a time. This more progressive method of cross-training allows flexibility in scheduling of workers for the Production Managers.

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050011

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SUBJECT T.O. 16

Management and/or supervisory training is more vague than the required training of shop people. Generally, there are manuals to explain procedures and new managers are "shown around", then handed manuals" according to an American Airlines employee who wished to remain anonymous! Actually, most management-types reported similar experiences.

On the flip side, Northwest Airlines has some rather innovative management training programs that have proved very successful. The Training Manager for MX Programs created a Part 121 workshop on MX & Engineering geared towards upper-level mngmt. The workshop covers: walk through of Pt 121 as it relates to MX; explains how FAA interprets 121; MX programs in general; MX manuals; equipment; data collection for design changes; and reliability.

Northwest Airlines is also working on a similar void-filling workshop in areas of budgeting, finance, accounting and management techniques for shop foreman and other lower-level supervisors/managers.

Planning/Scheduling:

As far as documentation for work cards (procedures and requirements/specs) is concerned, the airlines must be in compliance with their approved maintenance procedures. It is, therefore, imperative that methods work and keep the process flowing smoothly. When a method ceases to be cost-effective or efficient, a team is set up to rewrite the documentation and get it approved by the FAA.

At Delta, jobs are sent to Production Control (they are retrieved by computer up at Equipment Control) by job card listings. Production Control manually pulls all work cards, orders necessary parts & kits and sends to floor.

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050012

EMPLOYEE

LK3

DATE

242

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RCC

SUBJECT

T.O. 16

although United's system is computerized, there is still some manual work to job cards. Once an engine is off wing, the computer generates a complete overhaul list or a list of the particular inspections for the module written up.

The production team (includes engineers, foreman, etc) looks over the history of the engine, takes the notes from the ~~engine's~~ initial inspection and decides what tasks need to be done. This is input into their computer which assigns job numbers to each task & spits out a sheet listing the #'s. Then the remaining jobs are manually pulled from the work cards and discarded, leaving only what needs to be done. This are given to the floor for working.

At Continental airlines, Planning and Records work together to do all maintenance scheduling long term. Then MAT control, maintenance hangar supervisors and stores (parts/inventory) sit in on Monday morning planning sessions to work out the weekly schedule and review in-process work.

Scheduling of engines in and out of the shop is monitored by Planning. Most airlines actually send an "inspector" from the Planning dept down to the floor to make sure all parts are flowing through in a timely manner. "awaiting parts" is the only reason a component is allowed to have for not moving through.

The computerization and use of bar coding helps to track parts, modules, etc easily. Any unit that hasn't shown progress is physically tracked down with the aide of the computer. Delta is not using bar coding yet, but plans are in the works to implement this soon. They are, however, using serial #'s entered in the computer to monitor work flow.

EMPLOYEE LKBDATE 243PAGE NO. 1/5

RCC _____

SUBJECT T.O. 16 Major TopicsPlanning & Scheduling (cont)...

Engineering Support is an essential part of Plans, Scheduling and Records. Records plays an important role in providing historical data for decision-making purposes. Engineers are often attached to Records in the chain of command.

Engineering will usually lead the team in rewrites of documentation, and are called upon often to help solve problems that are out of the ordinary.

Continental Airlines uses a true version of Reliability Centered Maintenance, in that they are reviewing workflow, repeat write-ups on serial#s and regulations/procedures on a regular basis. They've been forced, because of in-house budget cuts, to be as frugal as possible ... which translates to efficient and cost effective.

Many airlines review maintenance practices in order to cut costs long term. Another major reason cited is to be able to provide more engines to the field that will remain operational.

Northwest Airlines found that engines remained in service longer when they initiated their current policy of reviewing engines brought in for unscheduled mx. If the engines met one of the following requirements, it went in for "EHM" (Eng Heavy mx):

- life limits are getting close in several/all modules,
- boroscope insp. shows extensive damage, or
- has just been a long time since last EHM.

They did find that costs raise somewhat due to more parts changed out, plus some increased labor; however, it was not significant enough to deter management. NWA does not keep a very large inventory of spare engines, so it pays to keep the engines working out in the field.

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United Airlines also has a new program that has allowed for smoother workflow and added to reliability of the engine fleet. It's called a Steady State program, which reviews engines within 200 cycles of hard time inspections. When workflow slows due to fewer unscheduled jobs and/or scheduled mx, Production Control and Planning can pull in an engine due a certain hard time insp in the near future. This can work even if a certain module repair shop is the only place without work since it's conceivable ~~to~~ to find an engine needing work in that area only. United says it saves money, keeps the Union happy, and controls workflow.

I found no airline with a real training program for new Planners, Schedulers or Record personnel. The closest to a program was United - they issue engine charts to new Planners, have a structured computer-training program and assign a "mentor" for the first month.

American Airlines essentially provides new personnel in these areas with all documentation available on current jobs in process, plus copies of and explanations of all forms used for the job. Computer initiation is giving, as well, since this is a major part of doing the job in all areas of Planning & Scheduling.

Process:

Overhaul vs. OCM vs. Return to Specs is a big question, as well as an area for argument in the industry. It depends largely on the main goal of the airline. This same subject was touched on during my discussion of engineering support & review of procedures for rewrite. Some airlines want to save money ~~in~~ in the mx area

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050015

ENGINEERING NOTES

EMPLOYEE LCBDATE 243PAGE NO. 3/5

RCC _____

SUBJECT T.O. 16

and some have the goal of keeping engines out of the shop for as long as possible. Still others simply want to get engines through the shop at breakneck speed.

"Overhaul", or actual ϕ timing, if done right puts the engine back out in the field for the longest period of time. "On-condition mx" (OCM) puts the engine back in service more quickly, but one usually sees the same serial #s coming through as few as 300 hrs later. "Return to spec" saves money over complete overhaul because many parts are re-used during buildup without any rework at all, but the engine will usually be back in about $\frac{1}{2}$ the time a completely overhauled engine will be returned for mx.

The complaint of "high infant mortality" is seen more from airlines that don't try to keep modules together during reassembly. Specifically, core buildup is critical. Certain engine components have been together since "birth" and reuniting them is best for the engine.

United airlines "match-grinds" their rotors to stators so that they must always remain together. It slows production down a little, but in the long run, engines run more efficiently. Certainly, awaiting modules creates the necessity for more efficient planning, but the system has been working smoothly. Planning is able to control this somewhat by telling Production what modules need to be torn down and in what order.

Delta gives each engine a tracking # and a bill of materials and they track the modules, parts and components through the overhaul cycle.

United does both overhaul & Return to Specs, depending on the age and the requirement in the field for engines. OCM is only done when it is one or two modules needing

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050016

ENGINEERING NOTES

EMPLOYEE LKB DATE 243 PAGE NO. 4/5
 RCC _____ SUBJECT T.O. 16

unscheduled work on an engine that has recently had a teardown completed.

American airlines does a "return to specs" on a module basis. They stopped doing complete overhauls when they needed to get engines back out faster and save money on parts. Reported that it doesn't speed things up that much and there is serious doubt as to how much money is saved in the long run if engines come back sooner. There is some study of this question currently going on.

Northwest, as I mentioned, brings in engines for unscheduled maintenance and often pulls it for an overhaul. They also bring in engines on hard-time and overhaul. They believe in overhaul because a Q-timed engine reduces the amount of removals for unscheduled reasons. They are dealing w/ the problem of high infant mortality rates, but believe there are ways to reduce those statistics. One suggestion they are trying is to run an engine on the test cell beyond normal requirements to try to catch more problems before they are released. "If standards are too low, raise them."

As I mentioned in the Plans & Scheduling section, tech data is highly regulated, and everyone must be following FAA-approved procedures. Design specifications are set by the manufacturer and airlines heed the advice of tech reps whenever possible. Engineers work closely w/ the tech reps and the shop personnel to solve problems and get current, workable procedures in everyone's hands.

QA is also an FAA requirement. QA must also fall outside of the MX chain of command.

United Airlines has the most inspectors on payroll - about 22 for every 100 mechanics. The industry average is about 8 or 9 and the next leading competitor is 12.

ENGINEERING NOTES

EMPLOYEE LICBDATE 243PAGE NO. 5/5

RCC _____

SUBJECT T.O. 16

United cites their early days of hiring many uncertified mechanics as the reason for this large # of inspectors. It is also why they are one of the leaders in training programs. But, said a shop foreman, "why drop your standards after you raise the percentage of A & Ps? We like being a leader in quality."

Lastly, in looking at Employee Suggestion Programs, I noted that most airlines have extremely well-publicized programs. Some have fancy names, like American Airlines, who use their trademark "AA" in everything. They have an IDEAS program and prizes include cash awards, quarterly plaques and the annual presentation of a brand new tool box to the IDEAS of the year from the shop floor.

United pays high cash awards and recognizes their contributors quarterly.

Delta also has a department of engineers who work through the huge number of suggestions that come ~~through~~ across the desks of supervisors from the shop floor. Delta, being non-union, has already laid the ground for flexibility and innovation, and the employees respond to their suggestion program regularly.

* American Airlines also has a department of 20+ people to process and research new ideas. A few years ago, a Bearing Refurbishment shop was opened up. One man has the job to inspect all discarded bearings, and so far the savings have been hundreds of thousands of dollar - since the reusable percentage rate is in the 90's!

ENGINEERING NOTES

EMPLOYEE GARDNER DATE 11 July 90 PAGE NO. 1
 RCC MATPFA SUBJECT UFC MM Engineering Problems

Interview Mr. John Register - MMF process engineer supporting the UFC repair process. He is currently the only engineer from MM assigned to support the UFC area, and one of only 20 assigned to support the entire F-100 engine world wide. He says he can only give 1-2 afternoons each week to the UFC area. A great deal of his time is consumed supporting various other efforts such as supplier/contract review and administration. The problem appears to be a difficulty in recruiting and retaining engineers. This situation is common throughout govt and commercial industry.

Mr Register identified several areas that he considered significant problems in the UFC repair process:

- No formal data is available on flowtimes through the process, or paths taken. Because the UFC OCM process is so complex and variable, a lack of such data makes it extremely difficult for him (or any other engineer) to detect specific problems, or perform trend analysis.
- The Tech. orders (TOs) used in the UFC ^{repair} process were written to support overhaul and are very difficult to use in an OCM environment. They do not contain many of the specifications the craftsmen need to make OCM decisions (these process decisions would not occur in overhaul). This TO deficiency forces the UFC area to rely on craftsmen's experience & judgement. This reliance makes the process extremely sensitive to craftsman turnover. It also adversely affects the feasibility of locating subcontract repair services.

ENGINEERING NOTES

EMPLOYEE GARDNERDATE 11 July 80PAGE NO. 2RCC MATPFASUBJECT UFC mm engineering problems

- Lack tolerance specs for wear/abrasion on many UFC piece parts. This causes an extremely high replacement rate for many parts - driving up costs and straining the supply system. Spares are extremely critical to the UFC Ocm process as Bendix is sole source on most parts (design data is proprietary) and requires a 2 year leadtime on most orders. The area MIC attempts to perform mat'l review on exchange items, to return serviceable items to service, but nothing is done for non-exchange parts.

~~John Register~~

when I recommended the formation of a mat'l Review Board (MRB) to evaluate replaced non-exchange parts, John Register explained that mm planned to create one by Oct 90. He didn't know the details of how the board(s) would be constituted, but did expect them to address non-exchange parts. I think this will help them quite a bit. Susan Schutte (MAWFT), who was also present, agreed to find a contact on the MRB development effort. I would like to find out how the A.F. plans to develop their MRB(s).

I discussed the possibility of improving the TOS to include both Ocm data and part condemnation specs. John explained that ~~a~~ a TO change is requested by the shop on an AFLC form 103 and put into work by mm on an AFLC 252. The procedure is generally so complex that it is seldom used properly. The most common procedure

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050020

ENGINEERING NOTES

EMPLOYEE GARDNERDATE 11 July 90PAGE NO. 3RCC MATPPASUBJECT UFC mm engineering problems

is for mm to approve a requested change by annotating the AFLC 103 (which is good for 120 days). If the shop does not insist on an AFLC 252 (good indefinitely - until cancelled or the TO is updated) the whole thing is usually forgotten.

I asked John about developing a local "process spec" which would reference the TO but provide specific mm guidance on OCM. He felt that it would be a good idea (Bendix uses their own process specs instead of the TO when they repair a UFC) and should be considered. He agreed that data generated by the MRB supporting the UFCs could be incorporated into the spec & used by the craftsmen to perform piece-part condemnation/replacement. This would act to reduce ~~the~~ parts consumption and relieve the demand for MRB/Engineering support. Neither John nor I could estimate the cost/duration involved in producing this spec. John indicated that, given approvals by mm, MAT, and QA, the document could be used legally on SA-ALC without changing the TO. He also pointed out that TO updates were over 2 years behind and cost approximately \$500/page to implement. Why update something that you don't use well anyway? I will follow up on this as a possible improvement recommendation.

Other points John made:

- He ~~is~~ is not heavily involved in facilities/equipment purchase decisions. MAT does this on their own.

- He was worried that a tight specification on a part would ~~require~~ require the craftsmen to measure each part & impede the parts flow.

DDB SECTION CODE 5.0

DDB PAGE NO. _____

050021

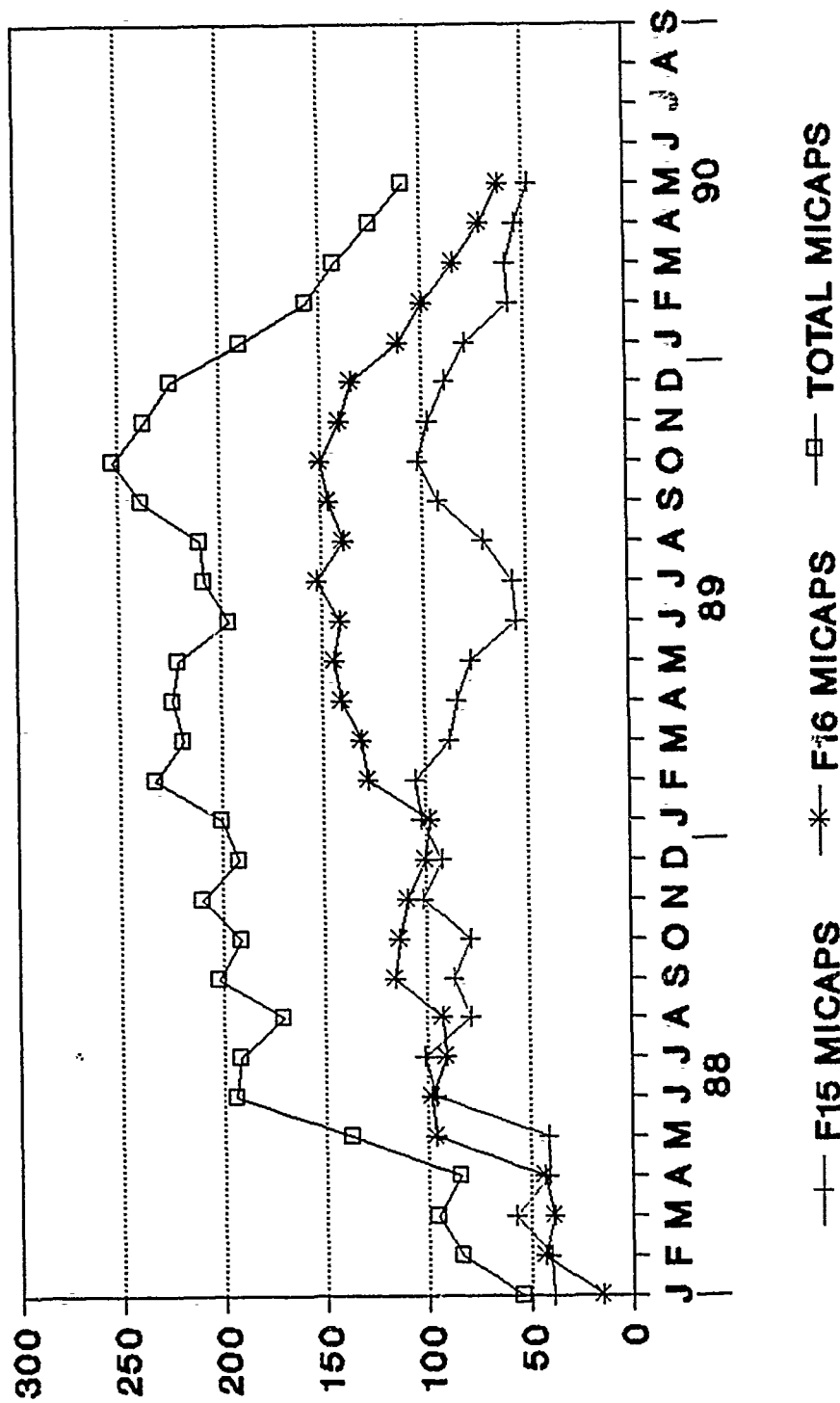
6.0
WORKLOAD

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
REP GENS	82	77	107	79	124	88	129	98				
PROD	76	62	81	108	102	100	100	100				
MICAPS	252	237	224	189	156	142	124	108				

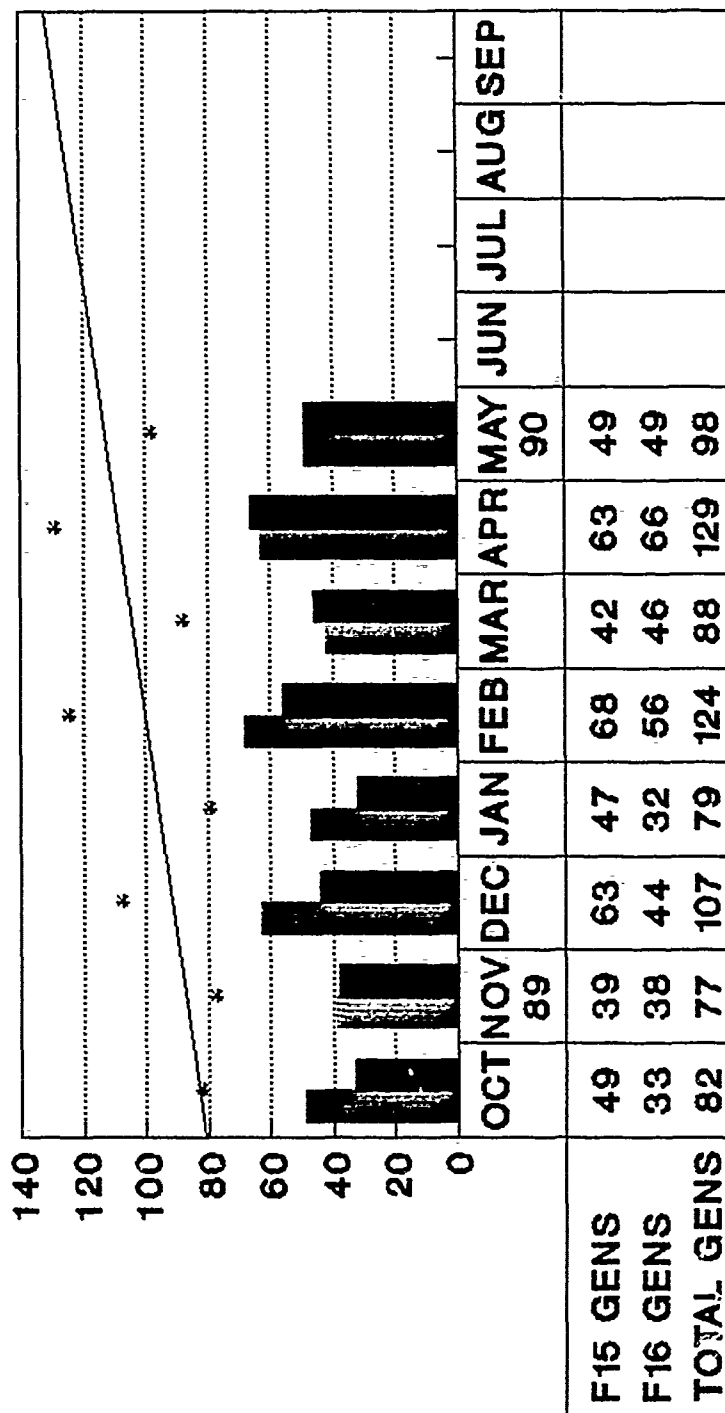
090001

Road from River Head camp (m11)
10 July 1980.

UNIFIED FUEL CONTROL MICAPS
JAN 1988-SEP 1990



UNIFIED FUEL CONTROL REP GENS OCT 89-MAY 90



1989 1990
 F15 GENS F16 GENS TOTAL GENS

MO AVE- 98, QTRLY AVE- 293.6

060003

3 AUG 1990

FROM: MATPF

SUBJECT: Average Flow Time

TO: Greg Gardner

Attached is the information requested.



ADAN SOSA, JR
Chief, Fuel Control Section
Technology Repair Division

2 Atch
1. F15
2. F16

060004

Edward Gonzalez

000000

45 Days
Avg Flowtime

F-15

0

45

What is avg time spent "on The Books" charged to MATPFA when the UFC is not actually in work?

5 days days/hours

5-10 % % UFCs
S.I.T Controls generally
AMP M/V affected

What is avg time spent "on The Books" charged to MATPFA while the UFC has been completed but has not been dropped from the MATPFA account?

_____ days/hours

_____ % UFCs
generally
affected

Any Time while the UFC is in work that should not be counted towards production? Please Describe.

9000390
70

7/ Days
Avg Flowtime
F-16

What is avg time
spent "on The Books"
charged to MATPFA
when the UFC is not
actually In Work?

21 days days/hours

10-15 % % UFCs
generally
affected
7070 - 538
7070 - 543

What is avg time
spent "on The Books"
charged to MATPFA
while the UFC has been
completed but has not
been dropped from the
MATPFA account?

_____ days/hours

_____ % UFCs
generally
affected

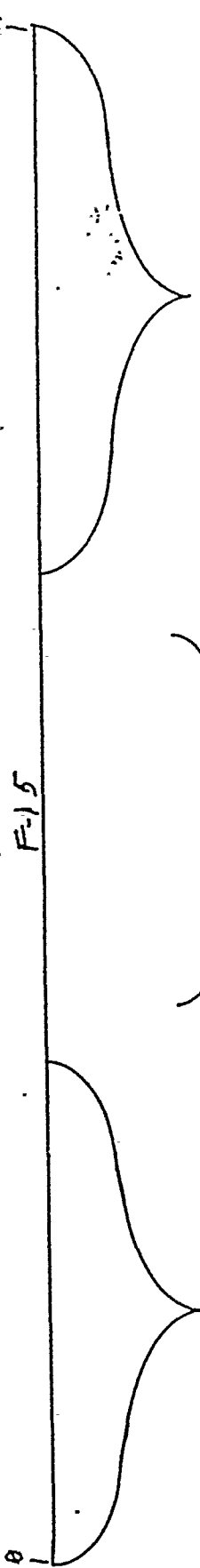
Any Time while the
UFC is in work that
should not be counted
towards production?
Please Describe.

Barnwell

0000007

45 Days
Avg Flowtime
F-15

45



What is avg time spent "on The Books" charged to MATPFA when the UFC is not actually In Work?

_____ days/hours
_____ % UFCs
generally affected

Any Time while the UFC is in work that should not be counted towards production? Please Describe.

When control is mounted on a test stand that is inoperative/ waiting On-Site repair.
When control is waiting to go into/or when control is placed in AWP Status.
While waiting on instructions/ recommendations from MM.
While waiting measurement/kits from contractor (Bendix)

What is avg time spent "on The Books" charged to MATPFA while the UFC has been completed but has not been dropped from the MATPFA account?

_____ days/hours
_____ % UFCs
generally affected

7/ Days

Avg Flowtime

F-16

7/

What is avg time spent "on The Books" charged to MATPFA when the UFC is not actually in work?

What is avg time spent "on The Books" charged to MATPFA while the UFC has been completed but has not been dropped from the MATPFA account?

Any Time while the UFC is in work that should not be counted towards production? Please Describe.

_____ days/hours

_____ % UFCs

generally affected

When control is mounted on a test stand that is inoperative/waiting on On-Site repair.

When control is waiting to go into/or when control is placed in AWP Status.

While waiting on measurement/kits from contractor (Bendix)

_____ days/hours

_____ % UFCs

generally affected

EMPLOYEE

Parker

DATE

7/2/90

PAGE NO.

3

RCC

MATPFA

SUBJECT

Flow times

7/2/90 - Monday

I picked up the fourth quarter '89 data from scheduling this AM. I was also able to obtain the standard hours for both the F-15 & F-16 aircraft. These were 59 and 57 days respectively (or 356 standard hours, which I assume are labor hours used for tracking purposes). Since there have been recent changes in the UFC production processes, I chose to use data collected from Oct. 89 to Jan. 90 to compute the expected hours, which is 116 days for the F-15 and 109 days for the F-16. I was somewhat surprised by these numbers, as I would have expected the F-16 to have longer flow days, as the shop is now required to perform a demate on all UFCs for this aircraft. The F-15 on the other hand, is only demated as needed.

MDB Section 6.0

000059

JULY PRODUCTION SUMMARY
UFC PRODUCTION TOTAL= 122

F-16 SUMMARY

TCTO 543= 39

TOTAL DEMATES= 41 OR 71%

TOTAL MINOR REPAIRS= 17 OR 29%

F-15 SUMMARY

TCTO 543= 5

TOTAL DEMATES= 29 OR 45%

MINOR REPAIRS= 35 OR 53%

UFC TOTAL REPAIR CLASS BREAKDOWN IS:

MAJOR REPAIRS 70 OR 57%

MINOR REPAIRS 52 OR 43%

JUST SAY "NO" TO "CHERRY PICKIN"!!!!!!

060010

6.1

LOG BOOK DATA

-

DATE		TEST STAND	S/N	AREA DISC													
1-May	5000217	30082	MAI	8:30	10:30	12:30	14:00	16:30	18:30	20:30	22:00	0330	2:30	4:30	6:00		
2-May	5000217	30082	MAI														
3-May	5000217	30082	MAI														
4-May	5000217	30082	MAI														
5-May	5000217	30082	MAI														
6-May	5000217	30082	MAI														
7-May	5000217	30082	MAI														
8-May	5000217	30082	MAI														
9-May	5000217	30082	MAI														
10-May	5000217	30082	MAI														
11-May	5000217	30082	MAI														
12-May	5000217	30082	MAI														
13-May	5000217	30082	MAI														
14-May	5000217	30082	MAI														
15-May	5000217	30082	MAI														
16-May	5000217	30082	MAI														
17-May	5000217	30082	MAI														
18-May	5000217	30082	MAI														
19-May	5000217	30082	MAI														
20-May	5000217	30082	MAI														
21-May	5000217	30082	MAI														
22-May	5000217	30082	MAI														
23-May	5000217	30082	MAI														
24-May	5000217	30082	MAI														
25-May	5000217	30082	MAI														
26-May	5000217	30082	MAI														
27-May	5000217	30082	MAI														

0001001

[illegible]

[illegible]

AREA B1 SORT

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	DATE	TEST STAND	S/N																										
2				8:30	10:30			12:30		14:00		X	16:30		18:30		20:30		22:00		X		0:30		2:30		4:30		6:00
3																													
4	25-May-50002/06	51590								51590	M&I	C/N	M&I	C/N	CONF TO PLUMB														
5	1-May-50002/06	51004	ASI		ASI		ASI																						
6	2-May-50002/06	51004	ASI		ASI		ASI																						
7	3-May-50002/06	50543	ASI		ASI		ASI																						
8	4-May-50002/06	50543	ASI		ASI		ASI																						
9	5-May-50002/06	50543	ASI		ASI		ASI																						
10	6-May-50002/06	50543	REWATED		READY TO PLUMB																								
11	7-May-50002/06	50543	M&I		M&I		M&I																						
12	8-May-50002/06	50543	SAT		SAT		SAT																						
13	9-May-50002/06	50494	ASI		ASI		ASI																						
14	10-May-50002/06	50494	ASI		ASI		ASI																						
15	11-May-50002/06	50494	M&I		M&I		M&I																						
16	12-May-50002/06	50494	SAT		SAT		SAT																						
17	13-May-50002/06	50495																											
18	14-May-50002/06	50945	ASI		ASI		ASI																						
19	15-May-50002/06	50945	ASI		ASI		ASI																						
20	16-May-50002/06	50945	ASI		ASI		ASI																						
21	17-May-50002/06	50945	TROUBLESHOOTING		TROUBLESHOOTING		M&I																						
22	18-May-50002/06	50945	TROUBLESHOOTING		TROUBLESHOOTING		M&I																						
23	19-May-50002/06	50945	LEAK TESTING		LEAK TESTING		PLUMBING																						
24	20-May-50002/06	30169	ASI		ASI		ASI																						
25	21-May-50002/06	30169	ASI		ASI		ASI																						
26	22-May-50002/06	30169	ASI		ASI		ASI																						
27	23-May-50002/06	30169	ASI		ASI		ASI																						
28	24-May-50002/06	30169	ASI		ASI		ASI																						
29	25-May-50002/06	30169	ASI		ASI		ASI																						
30	26-May-50002/06	30169	ASI		ASI		ASI																						
31	27-May-50002/06	30169	ASI		ASI		ASI																						
32	28-May-50002/06	30169	ASI		ASI		ASI																						
33	29-May-50002/06	30169	ASI		ASI		ASI																						
34	30-May-50002/06	30169	ASI		ASI		ASI																						
35	31-May-50002/06	51936	SOLD		OPEN		C/N																						
36	1-May-50002/07	32205																											
37	2-May-50002/07	32205	PAR		PAR		PAR																						
38	3-May-50002/07	50543	PAR		PAR		PAR																						
39	4-May-50002/07	32205	PAR		PAR		PAR																						
40	5-May-50002/07	32205	OPR 66		OPR 66		OPR 66																						
41	6-May-50002/07	32205	OPR 66		OPR 66		OPR 66																						
42	7-May-50002/07	32205	M&I		M&I		M&I																						
43	8-May-50002/07	32176	M&I		M&I		M&I																						
44	9-May-50002/07	32176	C/N		C/N		C/N																						
45	10-May-50002/07	32176	REPLACING DUMP VALVES		REPLACING DUMP VALVES		INSTALLING WORK COVER																						
46	11-May-50002/07	32176	ASI		ASI		ASI																						
47	12-May-50002/07	32176	AWAITING G>		AWAITING G>		AWAITING G>																						
48	13-May-50002/07	32176	C/OFF TO LOCATION		C/OFF TO LOCATION																								

8001008

AREA B1 sort

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
49	11-May 50002/07	51369			51368	CION	FLUSH		HOCKING UP	X										X	RAR	PLUMBING	NO OPR					
50	12-May 50002/07	51368	RAR CON			NO OPR	NO OPR		RAR CON	X										X	RAR	NEED RENEW RAR SOLD						
51	13-May 50002/07	51369	AWAITING WRITE UP						NO OPR											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
52	15-May 50002/07	30152	HOCKING UP	ASI					HOCKING UP	ASI										X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
53	16-May 50002/07	30152	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
54	17-May 50002/07	30152	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
55	18-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
56	19-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
57	21-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
58	22-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
59	23-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
60	24-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
61	25-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
62	26-May 50002/07	31625	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
63	27-May 50002/07	30708	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
64	28-May 50002/07	30708	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
65	29-May 50002/07	30708	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
66	30-May 50002/07	30708	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
67	31-May 50002/07	30708	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
68	1-May 50002/08	50815	SAT						SAT											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
69	2-May 50002/08	52007	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
70	3-May 50002/08	52007	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
71	4-May 50002/08	52007	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
72	5-May 50002/08	52007	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
73	6-May 50002/08	52007	ASI						ASI											X	ASI	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
74	7-May 50002/08	52007	READY TO MA						READY TO MA											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
75	8-May 50002/08	52007	M&I						M&I											X	M&I	M&I	M&I	M&I	M&I	M&I	M&I	M&I
76	9-May 50002/08	52007	PACKING CO						PACKING CO											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
77	10-May 50002/08	31532																		X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
78	11-May 50002/08	31532	COEFF						COEFF											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
79	12-May 50002/08	31532																		X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
80	13-May 50002/08	51638																		X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
81	14-May 50002/08	51638	SAT						SAT											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
82	15-May 50002/08	30073	ASI						ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
83	16-May 50002/08	30073	MINI FLUSHING						MINI FLUSHING											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
84	17-May 50002/08	30073	PLUMBING FOR ASI						PLUMBING FOR ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
85	18-May 50002/08	30073	ASI						ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
86	19-May 50002/08	30073	ASI						ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
87	20-May 50002/08	30073	ASI						ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
88	21-May 50002/08	30073	ASI						ASI											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
89	22-May 50002/08	30073	REJECT						REJECT											X	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
90	23-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
91	24-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
92	25-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
93	26-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
94	27-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
95	28-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR
96	29-May 50002/08	31764	RAR						RAR											X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR

©

062010

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
145	15-May	50002/10	51959								X	X									X	X							
146	16-May	50002/10	31330	RAR CON	OPENT/S DOWN				T/S PART IN MECH	X	X	RAR CON	RAR CON	RAR CON	RAR CON	NOOPR	NOOPR	RAR CON	RAR CON	RAR CON	X	X	RAR CON						
147	17-May	50002/10	31330	RAR CON	PLUMB FOR RAR				RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	NOOPR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
148	18-May	50002/10	31330	RAR CON	NOOPR				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
149	19-May	50002/10	31330	RAR CON	RAR CON				RAR	RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
150	21-May	50002/10	31330	RAR CON	OP 066				OP 066	OP 066	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
151	22-May	50002/10	31330	RAR CON	M&I				M&I	M&I	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
152	23-May	50002/10	31330	RAR CON	M&I				M&I	M&I	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
153	24-May	50002/10	31330	RAR CON	SAT				SAT	SAT	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
154	24-May	50002/10	31016	RAR CON	RAR CON				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
155	25-May	50002/10	31016	RAR CON	NOOPR				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
156	26-May	50002/10	31016	RAR CON	NOOPR				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
157	27-May	50002/10	31016	RAR CON	RAR				RAR	RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
158	29-May	50002/10	31016	RAR CON	RAR				RAR	RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
159	30-May	50002/10	31016	RAR CON	RAR				RAR	RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
160	31-May	50002/10	31016	RAR CON	RAR				RAR	RAR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
161	1-May	50002/11	51103	RAR CON	RAR CON				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
162	1-May	50002/11	51103	RAR CON	RAR CON				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
163	2-May	50002/11	51103	RAR CON	RAR CON				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
164	3-May	50002/11	51103	RAR CON	RAR CON				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
165	4-May	50002/11	51103	RAR CON	TOXICOLOGY CLASS				RAR CON	RAR CON	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
166	5-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
167	6-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
168	7-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
169	8-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
170	9-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
171	10-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
172	11-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
173	12-May	50002/11	51103	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
174	12-May	50002/11	31836	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
175	14-May	50002/11	31836	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
176	15-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
177	16-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
178	17-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
179	18-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
180	19-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
181	21-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
182	22-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
183	23-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
184	24-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
185	25-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
186	26-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
187	27-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
188	29-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
189	30-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
190	31-May	50002/11	31491	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
191	1-May	50002/12	52276	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
192	2-May	50002/12	52276	RAR CON	REJECT NEEDLE REMOVED				NOOPR	NOOPR	X	X	RAR	RAR	RAR	RAR	RAR	RAR	RAR	RAR	X	X	RAR	RAR CON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR

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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
289	1-May	50002/15	51986								X							51986	X	NOOPR			NOOPR					
290	2-May	50002/15	51986	HOCKING UP	ASI CION		ASI		ASI		X	ASI		NOOPR		NOOPR		ASI	X	NOOPR			NOOPR					
291	3-May	50002/15	51986	ASI NOOPR	NOOPR		NOOPR		NOOPR		X	ASI		NOOPR		ASI NOOPR		NOOPR	X	NOOPR			NOOPR					
292	4-May	50002/15	51986	TS DOWN	ASI		NOOPR		ASI		X	ASI		NOOPR		ASI *		ASI	X	ASI			NOOPR					
293	5-May	50002/15	51986	NOOPR	NOOPR		NOOPR		NOOPR		X	ASI		NOOPR		ASI		ASI	X	ASI			NOOPR					
294	6-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
295	7-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
296	8-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
297	9-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
298	10-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
299	11-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
300	12-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
301	13-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
302	14-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
303	15-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
304	16-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
305	17-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
306	18-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
307	19-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
308	20-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
309	21-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
310	22-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
311	23-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
312	24-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
313	25-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
314	26-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
315	27-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
316	28-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
317	29-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
318	30-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
319	31-May	50002/15	51986	GOING D/B	REJECT				NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
320	1-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
321	2-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
322	3-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
323	4-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
324	5-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
325	6-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
326	7-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
327	8-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
328	9-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
329	10-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
330	11-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
331	12-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
332	13-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
333	14-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
334	15-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
335	16-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					
336	17-May	50002/16	31491	ASI	NOOPR		NOOPR		NOOPR		X	NOOPR		NOOPR		NOOPR		NOOPR	X	NOOPR			NOOPR					

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
337	15-May	50002/16	30124	SAT	WADJ	SAT	ADD	SAT	SAT	SAT	X	SAT	X	DEMATING	TO ASI	MATING	ASI	OP 066	X	ASI	OP 066	X	ASI	OP 066	ASI	NOOPR	ASI	ASI	ASI
338	16-May	50002/16	30124	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X	ASI	X	ASI	MATING	MATING	MATING	MATING	X	MATING	X	ASI	OP 066	ASI	NOOPR	ASI	ASI	FLUSH	
339	17-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	MATING	X	PROBLEM	ROCKET	FIRE	M&I	M&I	
340	18-May	50002/16	30124	M&I	M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT		
341	19-May	50002/16	30124	SAT	SAT	SAT	SAT	SAT	SAT	SAT	X	SAT	X	SAT	SAT	SAT	SAT	SAT	X	SAT	X	SAT	SAT	SAT	SAT	SAT	SAT	SAT	
342	20-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
343	21-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
344	22-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
345	23-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
346	24-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
347	25-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
348	26-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
349	27-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
350	28-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
351	29-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
352	30-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
353	31-May	50002/16	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
354	1-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
355	2-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
356	3-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
357	4-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
358	5-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
359	6-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
360	7-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
361	8-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
362	9-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
363	10-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
364	11-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
365	12-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
366	13-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
367	14-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
368	15-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
369	16-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
370	17-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
371	18-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
372	19-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
373	20-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
374	21-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
375	22-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
376	23-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
377	24-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
378	25-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
379	26-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
380	27-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
381	28-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
382	29-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
383	30-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	
384	31-May	50002/26	30124	PLUMB	FOR M&I	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	M&I	M&I	X	M&I	X	M&I	M&I	M&I	SAT	SAT	SAT	SAT	

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AREA B1 sort

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
481	30-May 50002/29	31782	1Z0012	OPR	066																							
482	31-May 50002/29	31782	M&I																									
483	1-May 50004/04	31673	NO OPR																									
484	1-May 50004/04	31673	NO OPR																									
485	2-May 50004/04	31673	NO OPR																									
486	3-May 50004/04	31673	NO OPR																									
487	4-May 50004/04	31673	OPEN																									
488	5-May 50004/04		OPEN																									
489	6-May 50004/04		OPEN																									
490	7-May 50004/04		OPEN																									
491	8-May 50004/04		OPEN																									
492	9-May 50004/04	50696																										
493	8-May 50004/04	52068																										
494	9-May 50004/04	52068	B/S NO OPR																									
495	10-May 50004/04	52068	NO OPR																									
496	11-May 50004/04	52068	OPEN																									
497	12-May 50004/04	OPEN	OPEN																									
498	14-May 50004/04	51228	NO OPR																									
499	14-May 50004/04	51228	B/S																									
500	15-May 50004/04	51228	B/S																									
501	16-May 50004/04	51103	GG																									
502	16-May 50004/04	51103	GG																									
503	17-May 50004/04	51103	GG																									
504	18-May 50004/04	51103	GG																									
505	19-May 50004/04	51103	GG																									
506	20-May 50004/04	51103	GG																									
507	21-May 50004/04	30662	B/S																									
508	22-May 50004/04	30662	B/S																									
509	23-May 50004/04	30662	B/S																									
510	24-May 50004/04	30662	GG																									
511	25-May 50004/04	30662	GG																									
512	26-May 50004/04	30662	NO OPR																									
513	27-May 50004/04	30662	14																									
514	29-May 50004/04	80662	GG																									
515	30-May 50004/04	52151	NO OPR																									
516	30-May 50004/04	31345																										
517	31-May 50004/04	31345	GG																									
518	1-May 50004/05	OPEN	NO OPR																									
519	2-May 50004/05	OPEN	NO OPR																									
520	3-May 50004/05		OPEN																									
521	4-May 50004/05		OPEN																									
522	5-May 50004/05		OPEN																									
523	6-May 50004/05		OPEN																									
524	7-May 50004/05		OPEN																									
525	8-May 50004/05		OPEN																									
526	8-May 50004/05	51238																										
527	9-May 50004/05	OPEN	OPEN																									
528	9-May 50004/05	51238																										

[illegible]



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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
627	16-May	50004/08	NO OPR	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG
628	17-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
629	18-May	50004/08	51238	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
630	18-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
631	19-May	50004/08	30662	TO BE INSTALLED	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
632	21-May	50004/08	30662	CON NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
633	22-May	50004/08	51633	CON NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
634	23-May	50004/08	51633	GG COFF	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG	GG
635	25-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
636	26-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
637	27-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
638	28-May	50004/08	OPEN	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
639	30-May	50004/08	30808	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
640	31-May	50004/08	30808	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
641	1-Jun	50004/08	50436	SOLD	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
642	2-May	50004/08	30419	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR	NO OPR
643	2-May	50004/08	30419	NO OPR																									

B1/SORT/ASI/M&I/SAT/GG

	A	B	C	D	E	F	G
1	50002-ASI		50002-M&I		50002-SAT		50004-GG
2	22		16		10		4
3	40		42		12		42
4	28		40		10		8
5	56		62		8		106
6	156		28		20		10
7	2		46		8		10
8	60		44		16		38
9	40		4		2		16
10	100		2		8		38
11	56		36		8		18
12	116		46		12		2
13	8		26		8		22
14	116		66		6		16
15	8		64		12		2
16	70		24		8		48
17	50		46		20		25.33
18	198		40		14		
19	20		44		32		PLUMBING?
20	36		38		14		AUG = 3.86
21	42		34		16		
22	10		34		8		
23	2		28		10		
24	186		2		24		
25	38		48		8		
26	4		32		14		
27	54		8		30		
28	34		18		16		
29	34		6		42		
30	38		24		16		
31	60		70		10		
32	20		46		12		
33	16		36		10		

B1/SORT/ASI/M&I/SAT/GG

	A	B	C	D	E	F	G
34	10		30		14		
35	56		14		16		
36	28		26		10		
37	64		40		16		
38	2		24		8		
39	6		32		32		
40	46		54		2		
41	16		44		18		
42	2		2		<i>006 = 124</i>		
43	22		8		50004-SAT		
44	2		<i>32.71</i>		14		
45	32		50004-M&I		24		
46	46		32		22		
47	24		56		2		
48	62		68				
49	50		36				
50	46						
51	58						
52	8						
53	4						

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AST	RIS	MIT	RIS	SF	RIS	GG	RIS	NO OPR
501590		16						
51004	Reject							18
50543		42		10	sold			28
50494		40		12	sold			
50495		62		10	sold			
51764								2
50169	sold							94
52205		28		8	sold			18
50543								34
52176	sold							18
51368								30
50152	Reject							20
51625		46		20	sold			38
50708				8	sold			50
50815		44		16	sold			32
51532								10
50073								2
51638	Reject			2				60
51764		4		8	moved			68
51441								24
52007		2			sold			
52041	sold							21
51834		36		8	sold			24
50481		46		12	sold			46
50279								26
51692		26		8	sold			
51219	Reject							34
52011		64		6	sold			12
51330		64		12	sold			28

Reject

Bar Part #	ASI	R/S	M/I	R/S	SA	R/S	GG	R/S	to opp
31016			24						38
50417	10								30
51103			46	Reject					26
31836	2								126
31491	196								Reject
51103			40						
52276	38		44		8	sold			6
30380	4		38						2
50136					20				
30777	54		34						56
31345			26						42
31251			30		14	sold			20
32942					32	sold			
30258	34		36		14	sold			
50616									
33059	34	Reject							60
51048	38		34		16	sold			
30255	60	Reject	34						72
51590			28		8	sold			
31616	20								10
30258	16								50
31616	10								
52322			2		10	Reject			
51996	54	Reject							62
50696	28	Reject							10
30713	64		48		24				52
32581	2	Reject							16
50694			32		8	sold			
32758			8		14				24
30152	6								
31491	46								30

B1500

Part #

AST

R/S

M.I.

R/S

SAT

R/S

G.G.

R/S

710 APR

51710

16

Reject

50

50574

2

Reject

18

30

4

30124

22

6

Reject

2

30569

2

24

16

Reject

12

30775

32

70

16

moned

32

52575

46

10

sadd

54

51213

46

36

12

sadd

18

30419

24

14

10

sadd

12

30896

24

26

14

sadd

90

31836

62

40

16

sadd

24

50136

50

32

10

sadd

24

30885

46

44

8

sadd

52

30649

58

2

32

sadd

12

31719

8

8

18

30

31485

4

32

14

sadd

24

30279

46

44

8

sadd

116

52010

58

2

32

sadd

52

31063

8

8

2

sadd

12

31062

8

8

18

30

51946

4

32

14

sadd

24

31764

72

56

24

sadd

18

52068

30569

68

22

Reject

31345

36

2

36

31782

36

16

31673

52068

38

sadd

B15081

Page 4

Part #

ASI

R/S

M/T

R/S

SAT

Q's

G-G

R/S

NOOPR

51228

30662

52151

31345

51238

51710

52006

32176

51238

31345

50153

52151

31749

51834

51007

31668

51207

50625

51077

50157

51103

51238

30662

51633

30908

50456

33059

31971

30601

31668

50004

22

76

18

14

20

220

36

24

36

14

24

14

52

2

48

12

30

16

24

18

14

14

12

46

88

34

132

24

sold

sold

sold

sold

sold

sold

Reject

sold

sold

sold

4

42

8

106

10

10

38

16

38

18

2

20

16

2

48

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25-May/50004/10	52531	NOOPR	GG	GG	SOLD	X NOOPR	NOOPR	52061	GG NOOPR	X OPEN	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
25-May/50004/10	52061		NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
26-May/50004/10	52061	GG CON NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
27-May/50004/10	OPEN	NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
30-May/50004/10	OPEN	OPEN	OPEN	OPEN	OPEN	X GG CON	GG	GG	GG	X GG NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
31-May/50004/10	31653	NOOPR	NOOPR	NOOPR	NOOPR	X GG	GG	GG	GG	X GG NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
1-May/50005/01	52353	ASI	0 ASI	0 ASI	0 ASI	X ASI	0 ASI	0 ASI	0 ASI	X ASI	0 ASI	0 ASI	0 ASI	0 ASI	0 ASI
2-May/50005/01	52353	ASILEAK	ASILEAK	ASI	ASI	X ASI	ASI	ASI	SOLD	X FLUSH	PLUMB	ASI	ASI	ASI	ASI
2-May/50005/01	50456					X				X					
3-May/50005/01	30456	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
4-May/50005/01	50456	ASI	SOLD	OPEN	OPEN	X				X					
4-May/50005/01	50153	CON	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
5-May/50005/01	50153	NOOPR	NOOPR	NOOPR	NOOPR	X ASI	NOOPR	NOOPR	NOOPR	X SOLD	FLUSH	NOOPR	NOOPR	NOOPR	NOOPR
6-May/50005/01	50440	OPEN	OPEN	OPEN	OPEN	X				X					
6-May/50005/01	50440					X ASI	ASI	ASI	ASI	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
7-May/50005/01	50440	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	SOLD	ASI
8-May/50005/01	51213	NOOPR	NOOPR	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
9-May/50005/01	51213	ASI	ASI	ASI	ASI	X ASI	SOLD			X ASI					
9-May/50005/01	30404		ASI	ASI	ASI	X ASI	ASI	30404		X CON	ASI	ASI	ASI	ASI	ASI
10-May/50005/01	30404	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	NOOPR	NOOPR	NOOPR
11-May/50005/01	30404	ASI	SOLD	CON	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
12-May/50005/01	30144	ASI	NEED MFS	NOOPR	NOOPR	X ASI	NOOPR	NOOPR	SOLD	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
14-May/50005/01	REMOVED 30144		DUE CALIBRATION	OPEN	OPEN	X DOWN FOR CALIBRATION				X					
15-May/50005/01	OPEN BEING CALIBRATED			OPEN	OPEN	X				X					
16-May/50005/01	OPEN	OPEN	OPEN	OPEN	OPEN	X				X					
17-May/50005/01	30253	NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	ASI	ASI	ASI	X OFF	OPEN	PLUMB	PLUMB	PLUMB	PLUMB
18-May/50005/01	51007	NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	ASI	ASI	NOOPR	X ASI	ASI	ASI	ASI	ASI	ASI
19-May/50005/01	51007	NOOPR	NOOPR	ASI	ASI	X GONG CB	ASI	ASI	ASI	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
21-May/50005/01	51007	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	SOLD	X FLUSH	CON	ASI	ASI	ASI	ASI
22-May/50005/01	50927	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
23-May/50005/01	50927	ASI	ASI	ASI TURN ON	ASI	X ASI	ASI	ASI	ASI	X ASI	SOLD	CON	CON	CON	CON
24-May/50005/01	30104	ASI CON	PLUMB	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
25-May/50005/01	30104	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X SOLD	S/F	CON	CON	CON	CON
26-May/50005/01	50118	CON ASI	NOOPR	NOOPR	NOOPR	X GG CON	NOOPR	NOOPR	NOOPR	X NOOPR M/C ON	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
27-May/50005/01	50118	NOOPR ASI CON	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
29-May/50005/01	50118	ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
30-May/50005/01	50118	SOLD COFF	OPEN			X				X					
30-May/50005/01	52322			52322	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
31-May/50005/01	52322	ASI SOLD	COFF			X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
31-May/50005/01	30861			30861	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	ASI	ASI
1-May/50005/02	50915	ASI	0 ASI	0 ASI	0 ASI	X ASI	0 ASI	0 SOLD	0	X					
1-May/50005/02	50838					X				X					
2-May/50005/02	50838	ASI	NOOPR	NOOPR	NOOPR	X ASI	ASI	ASI	50838	X ASI INST	0 ASI	0 ASI	0 ASI	0 ASI	0 ASI
3-May/50005/02	30838	ASI	ASI	ASI	ASI	X FLUSH			ASI	X ASI	ASI	ASI	ASI	ASI	ASI
3-May/50005/02	30588					X				X					
4-May/50005/02	30588	ASI	ASI	ASI	ASI	X				X					
5-May/50005/02	30588	NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
6-May/50005/02	30588	NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	NOOPR	NOOPR

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11-May	50005/06	31121	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/ASI	ASI	ASI	ASI	ASI
14-May	50005/06	51632	NOOPR	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X/TS DOWN	ASI	ASI	ASI	ASI
15-May	50005/06	51632	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	ASI
16-May	50005/06	51632	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/ASI	ASI	ASI	ASI	ASI
17-May	50005/06	51098	ASI	ASI	ASI	ASI	ASI	ASI	ASI	SOLD	REMOVE	X/REMOVED	ASI	ASI	ASI	ASI
18-May	50005/06	51228	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/ASI	ASI	ASI	ASI	SOLD
19-May	50005/06	51228	ASI	CON	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	SOLD
21-May	50005/06	31615	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	SOLD
22-May	50005/06	31615	C/OFF	OPEN	CLEANING SINK	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	SOLD
22-May	50005/06	50694	ASI	ASI	50694	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	ASI
23-May	50005/06	50694	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	ASI	X/ASI	ASI	ASI	ASI	ASI
24-May	50005/06	50694	ASI SOLD	C/OFF	30306 ASI PLUMB	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
25-May	50005/06	51103	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
26-May	50005/06	30306	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
27-May	50005/06	30306	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
29-May	50005/06	51077	FLUSH ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
29-May	50005/06	30401	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
30-May	50005/06	30401	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
31-May	50005/06	30401	ASI	ASI	ASI	ASI	ASI	ASI	ASI	NOOPR	NOOPR	X/NOOPR	NOOPR	NOOPR	NOOPR	NOOPR
19-May	50005/06	31615	GG	GG	GG	GG	GG	GG	GG	GG	GG	X/GG	GG	GG	GG	GG
23-May	50005/10	52531	GG	GG	GG	GG	GG	GG	GG	GG	GG	X/GG	GG	GG	GG	GG

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347 -ASI/M&I/SAT/GG

	A	B	C	D	E	F	G
1	50002-ASI		50002-M&I		50002-SAT		50004-GG
2	30		2		12		2
3	8		26		6		14
4	2		102		12		42
5	4		82		18		32
6	2		4		12		6
7	18		72		4		36
8	2		8		12		20
9	4		40		18		32
10	10		2		8		24
11	2		20		6		34
12	8.2		40		6		18
13	50005-ASI		38		8		14
14	38		2		18		44
15	26		42		10		14
16	22		16		12		36
17	30		34		6		26
18	30		2		30		8
19	46		48		22		42
20	8		40		16		42
21	6		38		8		26
22	42		62		6		2
23	42		34		12		10
24	38		50		14		nv6 = 23, 82
25	26		36		14		50005-GG
26	20		68		20		8
27	18		8		10		16
28	12		44		10		
29	24		64		2		nv6 = 11, 25
30	8		28		6		nv6 =
31	48		4		4		2, 923
32	88		38		6		
33	72		28		12		

11.25

347 -ASI/M&I/SAT/GG

A	B	C	D	E	F	G
34	42	30				
35	48	26				
36	18	28				
37	20	34				
38	34	32				
39	56	6				
40	6	26				
41	32	26				
42	68	4				
43	16	2				
44	36	48				
45	36	32.19				
46	24	50004-M&I				
47	18	8				
48	4	46				
49	12					
50	62	50005-M&I				
51	36	2				
52	20					
53	38					
54	58					
55	18					
56	22					
57	42					
58	2					
59	6					
60	14					
61	40					

30.67

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Part #	ASI	R/S	M/I	R/S	SK	R/S	GG	NO OPR
52434			2		12	sold		
50395			26		6	sold		
30104	30		102		12			22
51045			82		18	Remove		
30666			4		12	sold		
50153					4	Reject		
30353			72		12			4
50927	8	Remove	8					52
30306			40		18			
52322			2					
52324			20		8	sold		
50815					6	Reuse		
52353			40		6	sold		
51828			38		8	sold		
51228	2							
30404	4		2					2
51638			42		18			
31836								18
30353						sold		
50927			16					
31836								42
32107			34		10	sold		
51917			2					
31804			48					44
50440								4
51633								8
30144	2		40		12			
51632			38		6	sold		
50145			62		30	sold		
51179					22			
30104	18	Remove	34		16	Resold		

Part #	AST	RIS	mi I	RIS	SAT	RIS	GG	R/S	NO O.
50915			50		8	Sold			
50838			36		6	Sold			
52061			68		12	Reject			12
50440			8						
30404			44		14				
50153			64		14	Removed			2
51098			28						
51008			4		20	Sold			
31615			38		10	Sold	2		
31668			28	Reject					
30793			30						32
31444			26		10	Sold			
51401	2		28		2	Sold			
31029			34		6	Sold			16
30258	4								
31911			32		4	Sold			
30622			6						
51128	10	Sold	26		6				
33229									
51238			4						
30834			2		12				24
32136	2		48						
51901							2		
51103							14	Sold	
51828							42	Sold	
50945							32	Sold	46
51103							6	Reject	6
530169			8				36	Sold	32
530662							20	Reject	
530353							32	Sold	4
52086							24	Sold	36

Port #	AST	R/S	M&I	R/S	WAR	R/S	GG	R/S	NO OPP
31590							34	sold	4
31532			46				18	sold	
52061							14	sold	
30843							44		
51098							14	sold	
30618		sold							
51417							36		16
51475		sold							
50945									14
52054							26		10
30662							8	Remove	4
51590							42	sold	22
50696							42	sold	32
52531							26	sold	72
52061							2		22
31652							10		14
52353	38	sold							
50456	26	sold							
50153	22	sold							18
50940	30	sold							8
51213	30	sold							4
30404	46	sold							4
30144	8	sold							8
30253	6								10
51007	42								18
50927	42	sold							
30104	38	sold							
50118	26	sold	2				8		34
52322	20	sold							
30861	18								
50915	12	sold							

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Part #

AST

M.T.

R/S

SAT

R/S

GG

R/S

Page 4

30 APR

50838

24

30838

8

30588

48

30446

88

31542

72

50693

42

30656

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30618

52043

50499

51933

30380

51341

30258

31656

30073

51999

30104

51901

51838

51638

30404

51045

51433

50145

51663

30966

51103

30253

50395

5140

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

sold

6

78

22

22

50

52

14

98

16

18

16

16

8

16

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12

4

8

18

4

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Part #

Part #	ASI	R/S	MIT	R/S	SAT	R/S	GG	R/S	Page 5 10 APR
31029	62	Remove							
31911	36	Sold							24
30258	20	Sold							
31121	38								10
51632	58	Sold							2
51098	14	Sold							
51228	28	Sold							
31615	22	Sold							
50694	42	Sold							
30306	2								16
51103									14
30306	6	Sold							4
51077	74	Sold							
30401	40	Sold							8
31615									10
52531							16		6

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24-May 50002/03	51179	CORREL & COVER 6WK TEST	51179	51179	X MINI FLUSH	C/OFF	C/ON	OPER 066	X IOP 66	OP 66	OP 66	OP 66
25-May 50002/03	51179	SAT	SAT	SAT	X SAT	SAT	SAT	SAT	X SAT	SAT	SAT	SAT
26-May 50002/03	51179	C/OFF			X M&I	M&I	M&I	M&I	X BACK TO M&I	M&I	M&I	M&I
27-May 50002/03	30104	M&I	M&I	M&I	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR
28-May 50002/03	30104	M&I	M&I	M&I	X SAT	SAT	SAT	SAT	X SAT	SAT	SAT	SAT
29-May 50002/03	30104	M&I	M&I	M&I	X C/OFF	C/OFF	RESOLD		X			
30-May 50002/03	30104	SOLD	C/OFF	C/OFF	X C/OFF	C/OFF			X M&I	M&I	M&I	M&I
31-May 50002/03	51077	M&I	M&I	M&I	X M&I	M&I	M&I	51077	X M&I	M&I	M&I	M&I
1-May 50002/04	30104	ASI	ASI	ASI	X ASI	ASI	ASI	ASI	X ASI	ASI	ASI	ASI
2-May 50002/04	50915	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
3-May 50002/04	50915	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
4-May 50002/04	50915	SAT	SAT	SAT	X C/OFF	C/OFF	PLUMB		X			
5-May 50002/04	50938	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
6-May 50002/04	50938	SAT	SAT	SAT	X C/OFF	C/OFF			X NOOPR	NOOPR	NOOPR	NOOPR
7-May 50002/04	52061	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
8-May 50002/04	52061	RCV PROBLEM	RCV PROBLEM	RCV PROBLEM	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
9-May 50002/04	52061	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
10-May 50002/04	50440	C/OFF	C/OFF	C/OFF	X CON	CON	M&I	SAT	X SAT	SAT	SAT	SAT
11-May 50002/04	30404	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X			
12-May 50002/04	30404	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X 30404	M&I	M&I	M&I
13-May 50002/04	30404	REMOVED	REMOVED	REMOVED	X M&I	M&I	M&I	M&I	X SAT	SAT	SAT	SAT
14-May 50002/04	30404	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
15-May 50002/04	50153	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
16-May 50002/04	50153	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
17-May 50002/04	50153	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
18-May 50002/04	50153	CHECKING	CHECKING	CHECKING	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
19-May 50002/04	51098	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
20-May 50002/04	51098	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
21-May 50002/04	51098	SAT	SAT	SAT	X M&I	M&I	M&I	M&I	X SAT	SAT	SAT	SAT
22-May 50002/04	31615	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X PLUMB	M&I	M&I	M&I
23-May 50002/04	31615	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
24-May 50002/04	31615	DROPPED BEARING	M&I	M&I	X M&I	M&I	M&I	M&I	X SAT	SAT	SAT	SAT
25-May 50002/04	31615	RELINING SLITTER	SOLD	SOLD	X M&I	M&I	M&I	M&I	X SAT	SAT	SAT	SAT
26-May 50002/04	31668	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X 31668	M&I	M&I	M&I
27-May 50002/04	30793	NOOPR	NOOPR	NOOPR	X TROUBLESHOOTING	M&I	M&I	REJECTED	X REMOVED	M&I	M&I	M&I
28-May 50002/04	30793	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR
29-May 50002/04	30793	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR
30-May 50002/04	30793	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR
31-May 50002/04	30793	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR	X NOOPR	NOOPR	NOOPR	NOOPR
1-May 50002/05	31444	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
2-May 50002/05	31444	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I
3-May 50002/05	51401	M&I	M&I	M&I	X M&I	M&I	M&I	M&I	X M&I	M&I	M&I	M&I

[illegible]

061949

AREA D/ASIM&I/SAT/GG

	A	B	C	D	E	F	G
1	50002-ASI		50002-M&I		50002-SAT		50005-GG
2	16		36		8		2
3	10		24		12		2
4	32		6		14		
5	44		16		12		
6	4		28		2		
7	8		28		12		
8	6		24		12		
9	64		54		8		
10	10		18		10		
11	78		28		22		
12	54		12		6		
13	8		24		10		
14	~~302~~		18		2		
15	2		16		16		
16	28		12		2		
17	98		2		16		
18	32		30		12		
19	96		18		8		
20	72		14		12		
21	68		20		6		
22	6		26		8		
23	54		16		14		
24	16		68		8		
25	44		62		16		
26	106		36		16		
27	4		56		8		
28	166		20		10		
29	36		6		12		
30			26		8		
31	~~52.29~~		12		10		
32	~~43.04~~		2		6		
33			28		8		

020190

AREA D/ASI/M&I/SAT/GG

	A	B	C	D	E	F	G
34			62		2		
35			16		10		
36			32		10		
37			30		20		
38			36		8		
39			52		14		
40			28		22		
41			40		6		
42			54		12		
43			22		24		
44			42		12		
45			72		10		
46			2		14		
47			2		2		
48			88		10		
49			26		6		
50			10		10		
51			42				
52			62		18.57		
53			8				
54			24				
55			32				
56			34				
57			30				
58			46				
59	PLUMB/N63		54				
60	MB : 3.19		16				

29.63

081051

Pair #

ASI

R/S

M.I

R/S

SAT

R/S

GG

R/S

NOOPR

31355

30130

30703

51271

32205

51007

30843

31689

31972

30396

31849

30690

31656

51010

32945

51007

52061

52006

50118

51112

51999

52554

50456

52554

30977

30527

51663

31488

50456

50625

Reject

18

14

20

26

16

68

24

62

36

56

20

6

26

12

2

28

62

16

32

30

36

Reject

12

6

8

14

8

16

14

8

16

14

8

10

12

8

10

12

8

16

8

10

10

6

2

8

24

28

98

32

32

Reject

32

8

6

48

14

10

20

16

8

58

22

14

6

180

8

16

8

16

8

8

8

8

8

8

8

8

8

8

8

8

Order #	Qty	Unit Price	Total Price	Notes
50222	96	Rejeer	30	
31303			24	
30684			6	
30818				
51207	72	Rejeer	24	
52054				
31121				
32211		Rejeer	14	
31291			24	
30169			6	
30662			6	
52010			32	
30885	68	Rejeer	22	
32610	6		12	
32615	54			
32268			4	
32059			26	
52054			6	
31665	16			
50641	44		26	
52135	106		38	
30684			4	
31997			22	
30073			4	
50871				
51632				
51128			4	
30253				
31615				
52043			14	
50925				

Area D Soil
Pour #

Page 4

AST R/S M.I. R/S SAT R/S G-G R/S NOOP

(30684				12	sold	2		4
5000 31638		32		10	sold			
32577		34		14	sold			
31054				2			40	
52531							32	
51917	4						74	
52463	166	30		10	sold		6	
50871	36	46		6	sold			
51228		54		10	sold		6	
30684							8	
30818		16						
50002								

061025

Area 0 Sort

Part #

AST

R/S

M.I.

R/S

SAT

R/S

CG

R/S

Comments

Page 6

5013150121

5013150222

50020

52081

51946

50118

52188

30708

51012

30753

31179

30861

31509

30165

30861

301521

31168

51526

30618

30255

51663

50694

50118

52188

50927

51946

50641

50096

30255

NO OPP

Reject

sold

Reject

sold

sold - Reject

sold

sold

sold

Reject

Reject

sold

sold

Reject

sold

sold

sold

sold

sold Reject

Reject

sold

sold

sold

sold

sold

sold

sold

sold

sold

Reject

7.0
SUPPORT

ENGINEERING NOTES

EMPLOYEE RANDY HARRISDATE 7/23/90 - 7/27/90PAGE NO. 1RCC MATPFASUBJECT MIC - SPARE PARTS INVENTORYMIC - SPARE PARTS INVENTORY

THE MIC SECTION OF THE UFC PRODUCTION AREA IS RESPONSIBLE FOR MAINTAINING SPARE PARTS FOR UFC COMPONENTS. THE STOCK ALLOCATION FOR EACH PART IS DETERMINED ACCORDING TO THE HISTORICAL PERCENTAGE USAGE OF THE PART. THUS, THE MONTHLY AND QUARTERLY REQUIREMENTS OF UFCs HELP DETERMINE WHAT THE REQUIREMENT WILL BE FOR THE SPECIFIC PART. THE STOCKING LEVEL WILL THEN BE CALCULATED BASED UPON WHAT STOCK AMOUNT IS NECESSARY FOR A 15-DAY INTERVAL. THE DS WAREHOUSE STOCKS A 30-DAY LEVEL. WHEN THE 15 DAY QUANTITY DROPS TO HALF OF ITS LEVEL, THEN A REORDER QUANTITY IS ISSUED, A CONSTRAINT WHICH EXISTS FOR THE SPARE PARTS IS THE COST ASSOCIATED WITH THE PARTS. APPARENTLY MM HAS A FIXED BUDGET FOR SPARES AND WILL ONLY ORDER HALF OF THE REQUESTED QUANTITY WHICH COULD IN SOME CASES EVENTUALLY LEAD TO A STOCK-OUT. EACH WEEK A REPORT WILL BE GENERATED BY SCHEDULING WHICH LISTS THE CRITICAL ITEMS WHICH ARE IN STOCK-OUT STATUS AND HAVE CAUSED OR MIGHT CAUSE A PART TO GO AWP OR REQUIRE A LEGAL ROB-BACK. OVER THE PAST YEAR, THE RANGE OF UFCs HAVING TO GO AWP HAS RANGED FROM A LOW OF TO A HIGH OF. THEREFORE, AN INVENTORY ORDERING/FREQUENTLY STUDY MIGHT BE APPROPRIATE TO HELP ALLEVIATE THE PARTS SHORTAGE SITUATION.

WE ARE CURRENTLY EXPERIMENTING WITH AN EOQ INVENTORY MODEL EXTENDED FOR THE RANDOM DEMAND OF THE SPARE PARTS TO DETERMINE IF IT WILL BE FEASIBLE FOR THE CURRENT PROBLEM. IF NECESSARY, THE MONETARY RESTRAINT FOR SPARE PARTS ORDERING CAN BE BUILT INTO THE MODEL. AN EXAMINATION OF MM'S ROLE IN THE PROCESS AND A STUDY OF (1) WHAT MODIFIERS COULD POSSIBLY BE MODIFIED, AND (2) HOW MIC CAN WORK WITHIN THE RESTRAINTS IF AN OPTIMAL R AND Q CANNOT BE OBTAINED. IF STOCK-OUTS CAN BE DECREASED OR PERHAPS ELIMINATED, THE PRODUCTION SITUATION COULD BE ENHANCED TREMENDOUSLY.

From: DSSDLT (Capt Nadeau 5-6580)

27 Jul 90

Subject: UFC Time in Warehouse

To: MD IPI Team

1. We have prepared the information that you requested and hope you find it useful in your efforts. Due to the nature of the underlying data I have only limited confidence in the accuracy of the incoming numbers but am quite confident of the outgoing. The reason for this is that none of our systems here track incoming reparable assets by serial number. Since UFCs are produced in a regular cycle, specifically Monday turn-ins are usually very large because they reflect weekend production, it is fairly easy to track this "bubble" and get reasonable outgoing information. Unfortunately, the pattern of incoming UFCs enjoys no such regularity. The best we can do, therefore, is assume that the first ones in are the first out to the shop. I have my doubts as to the validity of this assumption but it allows us to make some estimate of the time they spend in the warehouse.
2. For F-16 UFCs, the range of incoming days went from 2 to 31 days with a mean of 7.5 and a std dev of 7.1. For the F-15 UFC the range extended from 2 to 22 days with a mean of 6.9 and std dev of 5.4. Outgoing, the range for both types of UFC was 1 to 3 days with a mean of 1.4.
3. I wish I could provide numbers to you with a higher confidence factor but, as we are all learning, the systems we live with here in the ALC are often not designed for the type of analysis you folks are doing. I hope that your team can highlight the problem and it will become a concern to those with the power to change these data collection systems. My personal guess is that we will become much more concerned with such factors as operational inventory and operational costs here in the very near future and we're going to need this kind of data to manage. If we can be of any further assistance, please call.

Paul F. Nadeau

Paul F. Nadeau, Cpt., USAF
Chief, Technical Liaison Unit

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