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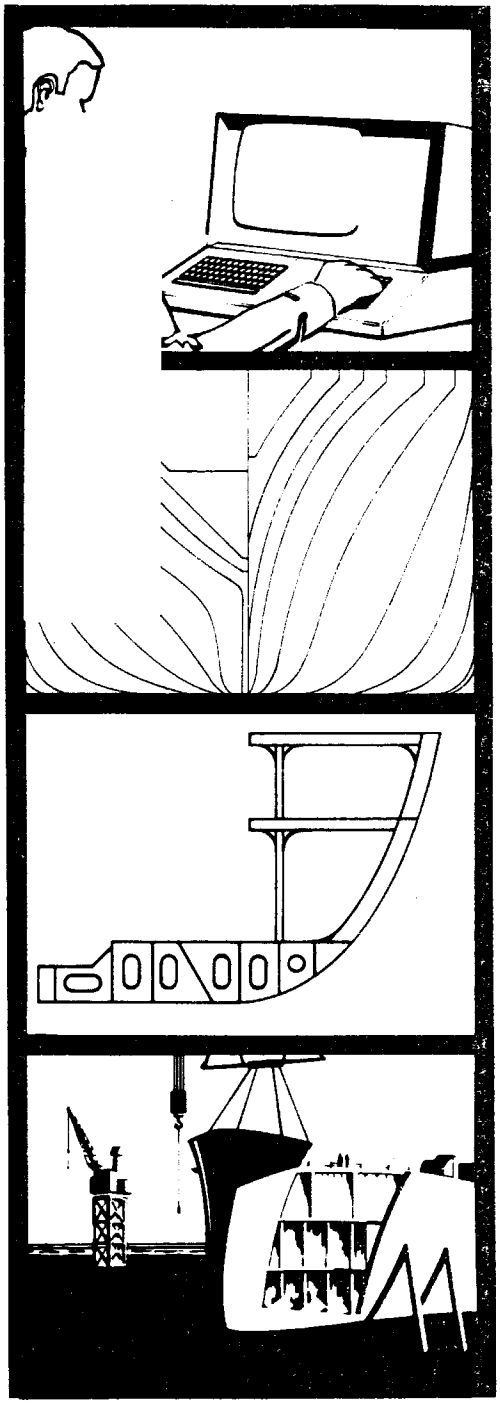

R ESEARCH
AND
E NGINEERING
FOR
A UTOMATION
AND
P RODUCTIVITY
IN
S HIPBUILDING

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NEW FEATURES FOR REAPS AUTOKON

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Ms. Taska has a B.S. degree in Mathematics from the Illinois Institute of Technology and is pursuing an M.S. degree in Computer Sciences also at IIT.

I. Background of REAPS AUTOKON

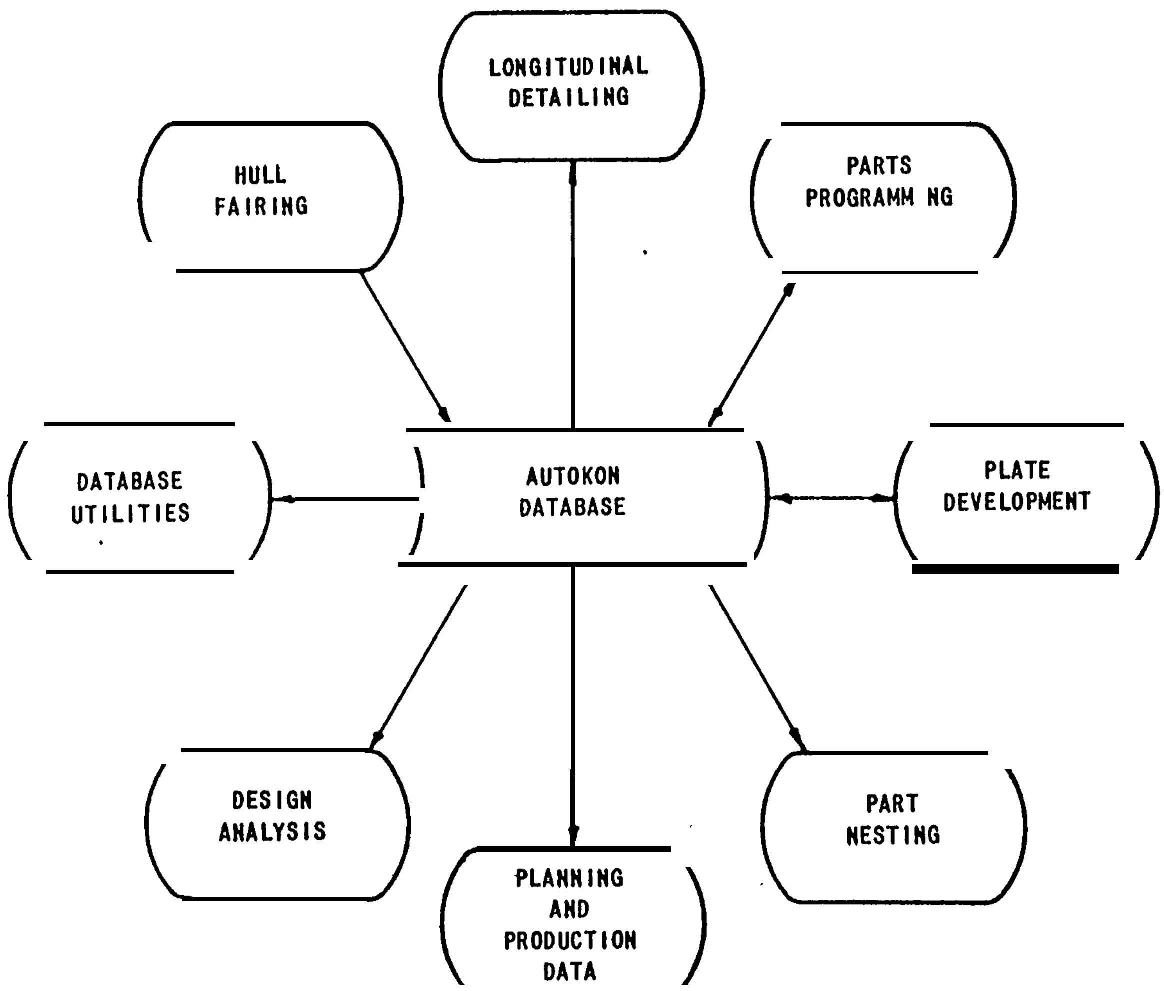
REAPS AUTOKON has emerged over the last three years as a valuable production tool in shipbuilding. Having its roots in the AUTOKON-71 System developed by Shipping Research Services (SRS) of Norway, REAPS AUTOKON consists of twelve independent computer programs communicating with a common database.

(SLIDE 1)

The REAPS Technical Staff maintains and enhances this system, which is available under a licensing agreement to all REAPS participants. Some of the most recent developments are discussed in this paper.

II. Enhancements to the ALKON Module

About a year ago, the REAPS program brought together a group of shipyard personnel, involved at the working level with AUTOKON, under the title of the Norms Enhancement Task Group. The purpose of this group was to exchange ideas, air complaints, and otherwise suggest improvements for the application of ALKON to parts programming. As a result of these initial meetings, the norms library was reviewed in detail, and significant modifications were made. Experimental Version BX1, which incorporated the Task Group's improvements, was released in November for incorporation into the database. In addition to that activity, two projects that significantly improve ALKON and respond to the user's needs have been spawned: Simplified ALKON and the conversion of some norms to inline code. A description of those projects follows.


LONGITUDINAL DETAILING
HULL FAIRING
PARTS PROGRAMM NG
DATABASE UTILITIES
AUTOKON DATABASE
PLATE DEVELOPMENT
DESIGN ANALYSIS
PLANNING AND PRODUCTION DATA
PART NESTING

1. Simplified ALKON

Whenever REAPS AUTOKON is implemented at a new yard, personnel must undergo a period of orientation and training to learn to use the system's features. Feed-back from yards who have attempted to teach ALKON to new part coders indicates that learning the ALKON language seems to be one of the more difficult tasks for persons unfamiliar with programming techniques. Even for programmers, the principles of parts definition can become obscured by the complexities of the language and I/O syntax requirements. For an experienced user, the flexibility of ALKON is a desirable quality, but the beginner needs a simpler, more basic, approach to parts specification.

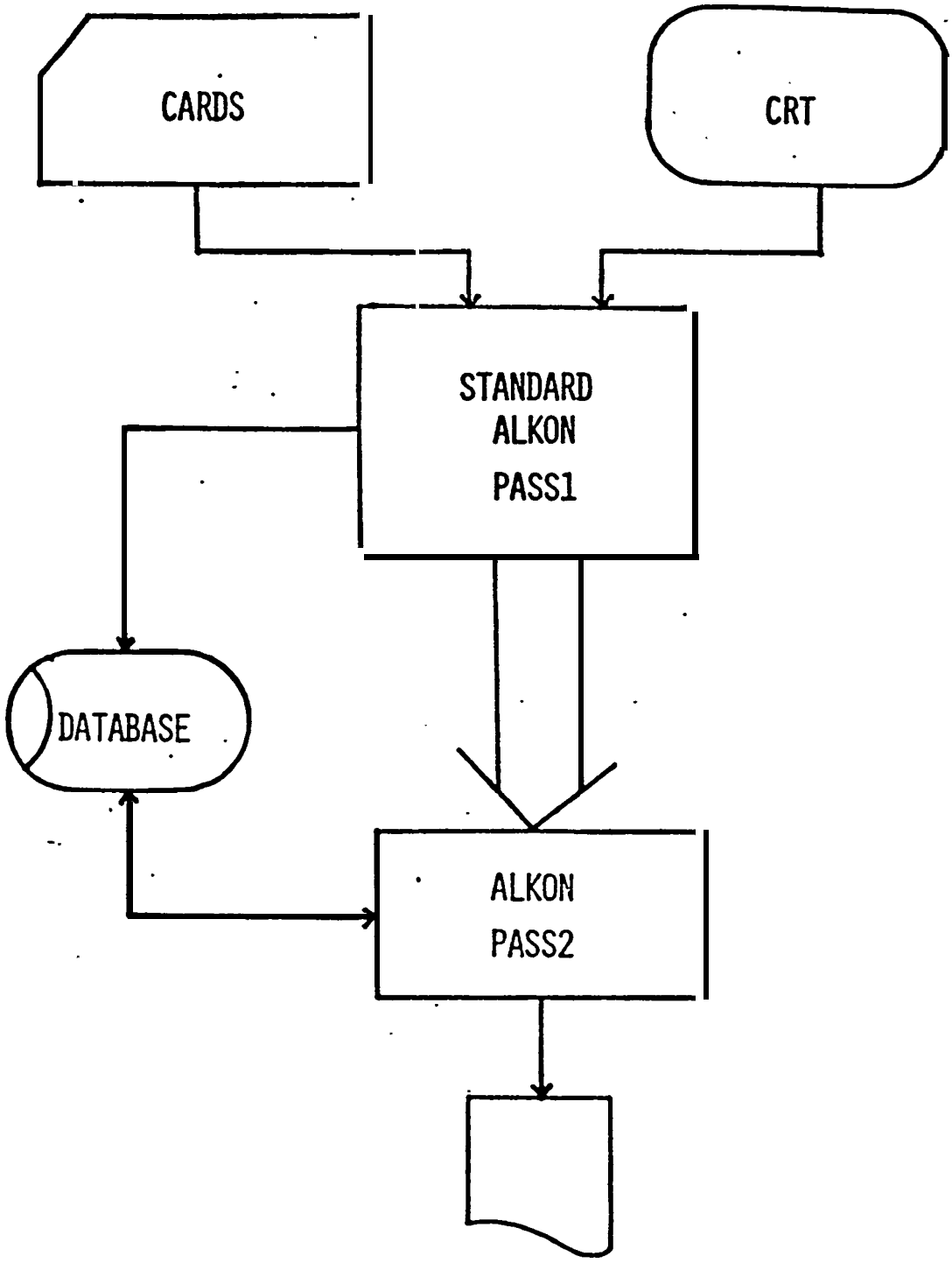
Simplified ALKON, now in its second release, has been designed and implemented through the combined efforts of the REAPS Technical Staff and yard personnel to eliminate some of these learning difficulties.

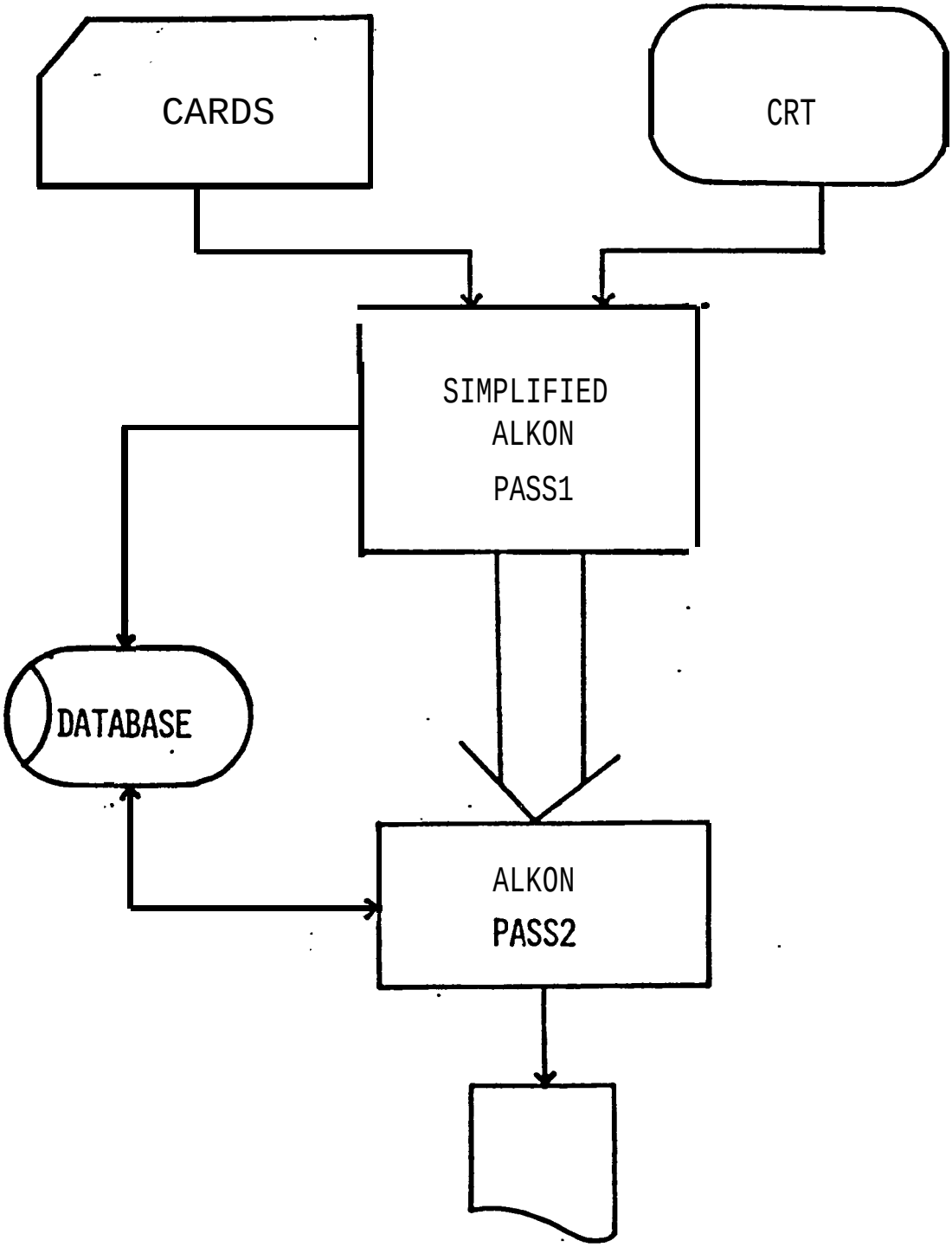
Standard ALKON accepts input from cards or CRT. Input is first compiled by PASS1, then executed by PASS2. Simplified ALKON works in exactly the same way, with a modified PASS1. Modifications to ALKON were all limited to the compilation stage to minimize the processing overhead.

(SLIDES 3A, 3B)

It is, as the name implies, simpler to use Simplified ALKQN than standard ALKON, The user gives shorter and fewer commands to accomplish part definition, All list, buffer, and matrix management is handled through defaults. The user can concentrate on geometry rather than on form.

(SLIDE 4)


CARDS
CRT
STANDARD
ALKON
PASS1
DATABASE
ALKON
PASS2


CARDS
CRT
SIMPLIFIED
ALKON
PASS1
DATABASE
ALKON
PASS2

SIMPLIFIED ALKON

- SIMPLER ALKON
  - DEFAULTS USED
  - SHORTER COMMANDS
  - FEWER COMMANDS
- CAPABLE
  - FULL GEOMETRY
  - SAME DATABASE
- LEARNING TOOL
  - SIMPLE MODE, OR
  - ALKON MODE
  - SWITCHABLE

Since Simplified ALKON is implemented on the Standard ALKON PASS1 compiler as a switchable option, it is every bit as capable as ALKON because it is ALKON with a new appearance. The same geometry specifications are available, and all database interfacing remains unchanged.

Fulfilling its original intent, Simplified ALKON is a learning tool. It is option-controlled, meaning that the user can operate partially in Simplified ALKON, escape into ALKON mode for extended capabilities, and then return to Simplified ALKON mode within a single manuscript.

A simple part description written first in Simplified ALKON and then in Standard ALKON points out the advantage.

(SLIDE 5)

Benchmark executions of Simplified ALKON, ALKON running under modified PASS1, and standard ALKON are given in this slide.

(SLIDE 6)

Bernie Breen of General Dynamics will present a paper detailing their experience with Simplified ALKON. The GROTON yard has been the test site for development of this tool.

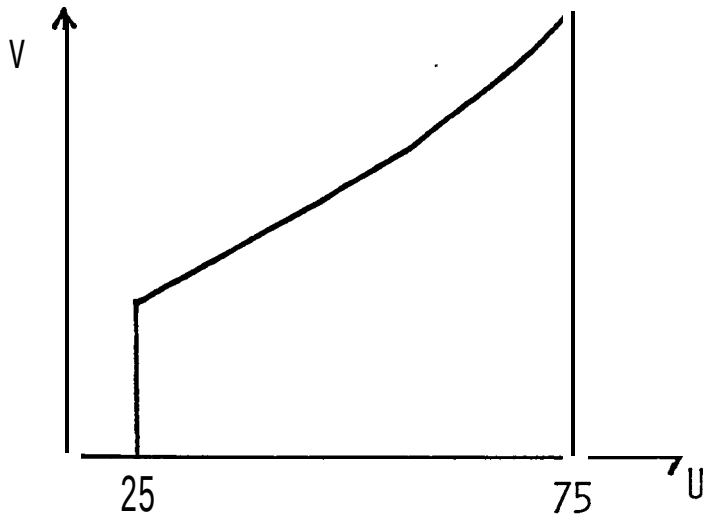
2. Norms to Inline Code Conversion

A second activity suggested by the Norms Enhancements Task Group has been the conversion of costly norms into ALKON commands. The primary objective of this project has been to provide new capabilities in the ALKON system where certain frequently used command combinations, often embodied in norms, may be handled in a more efficient manner. This would consequently simplify part programmer re-

```
PC 900001′ YN 456′
TFR 25′
SPT (+25+0)
Al = 90′
SL:DIR(+A1)
INT′ CON ' INT(+75+50)
B1 = 90′
SL:DIR(+Bl) EPT(+75+O)
NCOUT′
```

SIMPLIFIED

ALKON




```
NEW ALIST(50)
NEW BLIST(50)
NEW CLIST(50)
SBUF′
TEMP RBUF′
STRT TXT′
EDIT 1 (PART NO. 900001
  PROCESSED FOR HULL NO .4566
END TXT′
PRINTTXT′
TFRAME(25)
AT SHELL′
FETCH LCON '
FETCH LTAB′
STRT RGEO′
SPT(+25+O)
Al = 90′
SL:DIR(+A1)
INT′ CON′ INT(+75+50)
B1 = 90′
SL:DIR(+B1) EPT(+75+O)
END RGEO′
PRINTCON′
NCCON′
STORE(+5+0+900001+0+0+0)
```

ALKON

	SIMPLIFIED ALKON	ALKON "B"	% CHANGE
MANUS 1	1,483	1,112	26%
MANUS 2	1,155	1,209	-5%
MANUS 3	1,241	1,062	15%

quirements and reduce computer costs.

Eleven norms were selected for conversion to ALKON commands. These norms are frequently used, straightforward, and short combinations of ALKON commands.

Because of their simplicity, it is not expected that the user would ever have a need to make modifications, or to utilize the ALKON traceback debugging feature, which makes norm writing more desirable than inline coding in some cases.

In addition to these eleven converted norms, two more norms were streamlined by the improved coding.

Benchmark manuscripts comparing old norm calls with new inline calls in a standard manuscript show significant savings using the inline coding. This slide shows a table of the benchmark results.

(SLIDE 7)

Based on the satisfactory performance of these modifications, Norm Enhancement Task Group members evaluated all standard norms on an individual basis and drew up a prioritized list of norms for future streamlining.

(SLIDE 8)

III. Maintenance Activity Report

Regular maintenance of the REAPS AUTOKON System by the Technical Staff encompasses four areas of concentration: implementation of REAPS AUTOKON, Analysis Request processing, documentation modifications, and Standard Version C.

NORMS

-VS-

INLINE CODING

	ALKON "B"	INLINE	% IMPR
MANUS 1	1.07	,917	15%
MANUS 2	1,449	1 , 211	16%
MANUS 3	,888	. 634	29%

MANUS

```
NEW ALIST(1(0)
A1=2001   A2=4501   A3=501   A4=2501   A5=4501   A6=5001   A7=4001   A8=2501
PRLIST  (ALIST+1+0+l+8)                                              COMM(***]
COMM (TEST 1 OF EFFICIENCY OF INLINE CODE)
AXIS(+0+0+0)                                                         COMM(***)
TEMPL I                                                              COMM(***)
SPT(+A1+A1)
SL1TG[+A1+A2)
CTR:  RAD(+A3)    CNT(+A4+A5)
CTG(+A4+A6+A7+A6)                                                    COMM(***)
CIR:  RAD(+A3)    CNT(+A7+A2)
CTG(+A2+A2+A2+A4]                                                    COMM(***)
CIR:  RAD(+A3)    CNT(+A7+A4)
TG(+A5+A1)    SL:EPT(+A1+A1)
E N D    L G E O I .
PRINTCONl
```

NORM ENHANCEMENTS

UNDER DEVELOPMENT

GENTAB 2
INDECK 0
INLONG 0
INSEAM 0
SL 1
TG 1
TG 2
ENDGEO 0

DIST 1
PVAL 1
PVAL 3
CUTO 50
FUN 2
FUN 4
MARK 0
PVAL 4
PVAL 5
PVAL 6

INLINE WORDS UNDER DEVELOPMENT

PVALL xLIST, yLIST (zLIST)
ELSAVE xLIST yBUF (MATRIX)

1. Implementation of REAPS AUTOKON

Currently, REAPS AUTOKON is being maintained on three major computer installations: the UNIVAC 1108, the IBM 370, and the Honeywell 6080.

During the past year, the Technical Staff received the Bethlehem Shipbuilding Base Version of AUTOKON-71 and implemented it on a local IBM commercial machine. Updates were made to that version to bring it up to par with the UNIVAC 1108 Standard Version B of REAPS AUTOKON.

The Technical Staff is currently implementing Newport News Shipbuilding's Honeywell version of AUTOKON on a local Honeywell commercial machine. Several modules have been executed and all indications are that a successful implementation will conclude within the next few months.

2. Analysis Request Processing

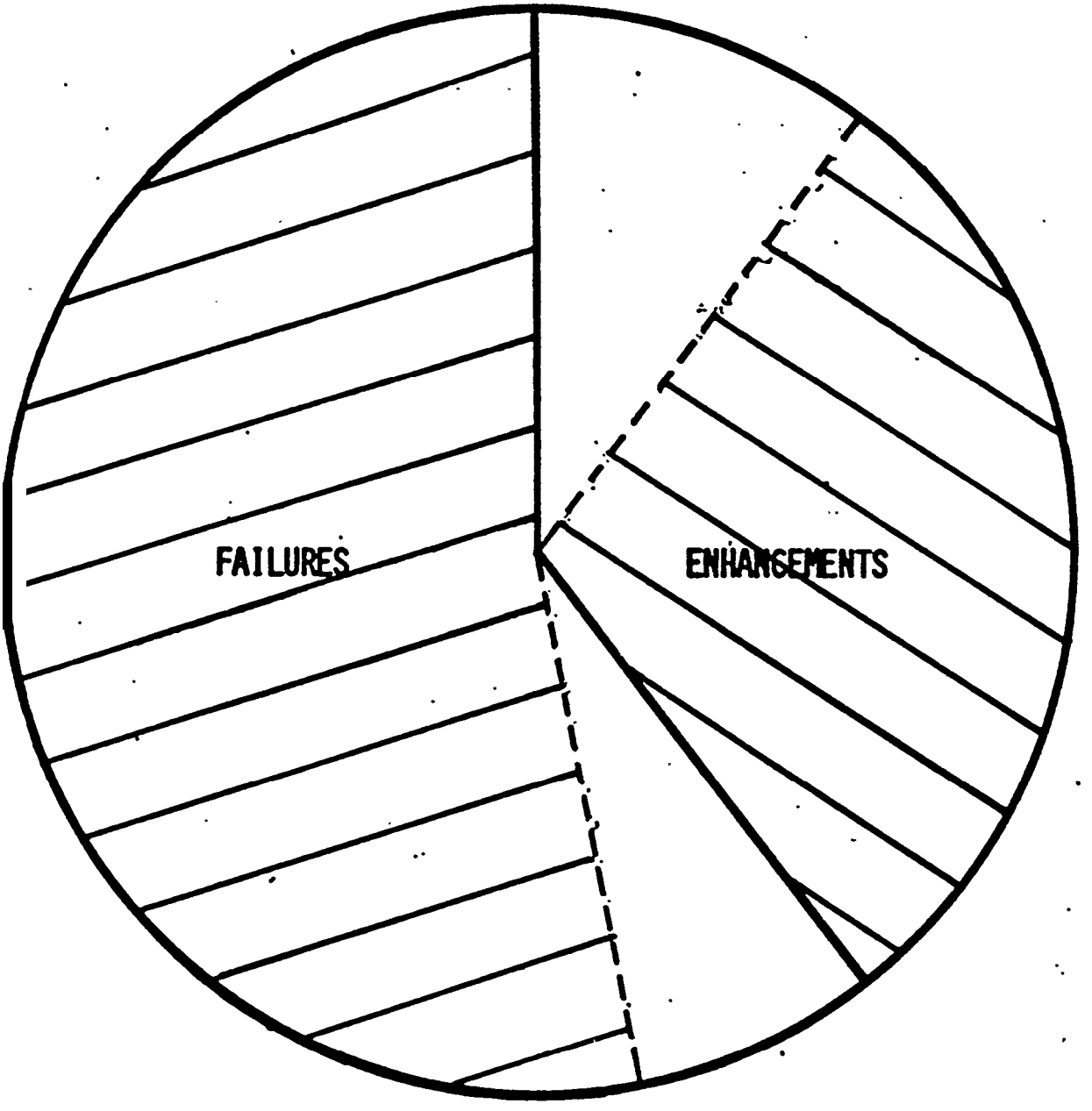
Concurrent with the support activities described above, continued maintenance, i.e., resolution of system failures and incorporation of minor enhancements, occurs throughout the year. The to-date totals on Analysis Request (AR) processing appear in this table.

(SLIDE 9)

3. Documentation Modifications

Over the past year, all five volumes of the REAPS AUTOKON User Manual have been updated to correspond to Version B of the System.

AR PROCESSING



	FAILURES	ENHANCEMENTS
REC'D	64%	35%
RES'LD	89%	69%

4. Expectations for Standard Version C

In August of this year, the third annual update to REAPS AUTOKON will be generated, creating Standard U.S. Version C. Resolved system failures and enhancements are planned, as usual, for inclusion. In addition, the following items are planned for release:

- INLINE COMMANDS

A X I S	RND
PVALC	CTG
RELORIGIN	PRLIST
RELORIENT	CMPRSS
PERML	PVALL
PERMR	ELSAVE
TEMPL	
TEMPR	

- STREAMLINED NORMS

ROUT 408	DIST1
PVAL2	PVAL1
GENTAB2	PVAL3
INDECK 0	CUT050
INLONG 0	FUN2
INSEAM 0	FUN4
SL1	MARKO
TG1	PVAL4
ENDGE0 0	PVAL6

- REVISED NORMS LIBRARY
- SIMPLIFIED ALKON
  - NEW VOCABULARY 10
  - AUGMENTED NORM LIBRARY
  - MODIFIED PASS1
- RESOLVED FAILURES
  - DUP
  - AUTOBASE
  - LANSKI
  - FAIR
  - D R A W
  - ALKON
- ENHANCEMENTS
  - NEW IF COMMAND