

WORLD HEADQUARTERS

POUGHKEEPSIE

Memorandum to: Mr. D. W. Pendery

October 2, 1956

Subject: SWIFT Tape Systems

While this memorandum is addressed to Mr. Pendery, the intent is to search out the reactions of every member of the Data Processing Systems Planning Department to the problems involved in the design of a SWIFT Tape System.

The hope is that this memorandum will serve as a door opener to the vast source of know how available throughout the department and that as a department, the best possible functional design objectives can be developed for the SWIFT System along with reasonable yardsticks as to their value. There are several areas in which Product Planning is particularly concerned. Before describing these areas, however, it seems advisable to describe the progress of the SWIFT program to date.

SWIFT "Task Force"

We are all aware of the fact that during the last month and a half, Engineering has placed considerable emphasis on the SWIFT program through a group known as the SWIFT "Task Force." This group has been made up of three members of Computer Planning. Weekly their progress has been reviewed by a board from the Engineering Department. The meeting on Monday, September 24, 1956, was the first meeting in which a member of Product Planning was present.

The major emphasis of this group has been to investigate the possible extension of known tape and tape drive principles in obtaining higher effective tape speeds. The development of tape systems has lagged somewhat behind the progress made in the area of computer design. The argument for a tape improvement program has been that while an improvement factor of two or three times 727 performance might be the most desirable if obtained quickly, such a program would require complete redesign of the 727. If complete redesign is necessary, it is reasonable to assume that for the same money, a speed increase of 5 or 10 might be possible.

The purpose of the SWIFT "Task Force" has been to make a preliminary investigation to estimate what the cost stepping stone picture might be when related to various improvement ranges.

While no definite specifications for the system have been named, some yardsticks have been derived for an Engineering group which has been recently set-up under the leadership of Mr. T. L. Vinson.

The SWIFT System

A SWIFT Tape System will include not only a tape drive, but also a synchronizer to make up a complete input system for a computer. The synchronizer will be capable of handling not only SWIFT Tape drives, but also 727 tape drives. It will probably also be necessary to provide a means for handling SWIFT Tapes on an off-line basis.

Complete Specifications Deadline

The date now being set for firm specifications for the entire SWIFT system is December 1, 1956.

Design Objectives for SWIFT

In meeting the specifications deadline, Product Planning must supply answers in several areas for SWIFT. The areas now under consideration are as follows:

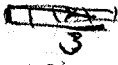
1. End of File

Developments, particularly in the 704 area, have revealed that a completely new end of file philosophy will evolve in all IBM large scale systems. The use of several reels of tape in a job show that end of reel and end of job should be separate configurations. The growing use of multiple file techniques not only in scientific applications, but also in commercial applications, indicates that there should be several different configurations for end of file. These configurations seem very possible in a SWIFT Tape System.

How many configurations should there be? ^② ~~How much are they worth?~~

X X 3, 4

X

trial 

2. Reels Which Look Like Continuous Reels

Multiple file techniques are now being used in the 704 area to make a series of small jobs look like one large job. The programs are stacked up on tape one after the other so that several hours of operation may be possible with one continuous stream of tape data coming into the computer. It is now possible to switch tape drives through program control when one reel is completed. It seems possible for a SWIFT system to allow the computer to handle tape drive switching automatically with a minimum of programmed housekeeping.

Along with this, cartridge loading, and provision for magazine loading would also be helpful. Should provisions for automatic tape drive switching be made in SWIFT system? ^{yes} While the cost should not be great, how much should such a provision be worth?

3. Read Backwards

Many scientific customers have requested the ability to read backwards. In their applications they must often make calculations in both directions on a table of data in order to establish the reliability of the approximation equations used in the calculation. A small group in this department, namely, Miss B. McDonough, Mr. W. English, and Mr. R. Goldfinger, has established that it is also of some value in commercial applications. These problems fall into the area of sorting, table searching in computer - type routines, restart procedures, output tape checking, and linear programming as applied to commercial applications.

The ability to read backwards is not an easy feat to accomplish in the 727. Should it be provided for in a SWIFT tape system? If so, how much is it worth? *plenty - even at slower speeds* ^{yes}

4. Searching Mode

There are a good many tape applications which resemble random access jobs. Very often these applications not only require searching through a table of data, but also require duplication of the inactive records on an output file. A searching mode would have some value in these applications. When the file does not have to be duplicated, a high speed searching feature seems most desirable. However, when the file must be duplicated, the tape still must move slow enough to allow duplication of the information on the output tape. In this application, a searching mode would only serve to free the computer from making a comparison on every record. The overall tape speed in searching would be no greater.

What kinds of searching modes should be specified for the SWIFT program? What will they be worth? *worth slower speed (factor of 2 or so)*
Compare register loadable from tape and ~~it~~ at least one other register

5. Peripheral Operation

At present, the Engineering thinking on peripheral equipment for the SWIFT system seems to be based on the conjecture that high speed SWIFT tape drives will be used primarily on the main computer. SWIFT tapes would be almost always read and be written on the main

computer. Tapes for low speed operation in peripheral equipment would always be read or written on 727 equipment. It certainly seems desirable to allow SWIFT tapes to operate in an off-line manner. The use of present techniques would make this rather expensive. If off-line operation for SWIFT tapes is necessary, how much is it really worth? *B. Box to dump S. tapes on 727*

or use TDS philosophy

6. The Confines of the System

In the input-output phase of computer operation, both SWIFT tapes and 727 tapes will be used. In the design of a synchronizer for the input-output, reasonable limitations must be set for the number of drives to be attached to the system. How big a system do we need? ²⁰ How many SWIFT tapes and 727 tapes must be included in the computer input-output system? *up to 20 S. or 727's*

7. Reel Capacity

With the higher packing which will be inherent in SWIFT tapes, much more information could be placed on a 2400 foot reel of tape. This is desirable for long jobs, but alot of jobs which must be kept separate would fill only a small amount of a reel.

How big a reel should we have? ^{2400 ft} Will we have to offer different length reels? *yes 100-300 ft*

8. Reliability

One of the chief concerns of the SWIFT program is to provide tape drives and tapes with higher reliability than present standards. In attaining this goal, two possibilities are evident. The first is to provide added checking bits as used in a Hamming or similar code for single error correction, double error detection. Secondly, would be a provision for a two gap head. Such a head allows immediate checking on information written on a tape so that its accuracy may be established at the time of its writing rather than when it is used in a reading operation some time later. In addition to this, it would seem advisable to provide Customer Engineering with better tools for their emergency work on the machine. For instance, it might be possible to provide a paper tape in the SWIFT tape drive which would record errors in particular tracks. Such information would be very *good!* valuable to Customer Engineers in correcting breakdowns. What other provisions of this nature might be possible? *Hamming code*

9. Actual Speed

Possibly, the biggest question in the SWIFT program is still, what speed ranges are really desired for present computer operation. It may be possible to offer a SWIFT tape drive at several speeds. If so, the desirable ranges of speed must be established.

Further Considerations

The above areas are the areas now under consideration in this department. Are there any other areas which have been so far neglected? If so, it is particularly vital that these areas be turned up quickly.

Any contributions, either new ideas or extrapolations of old ideas, will be greatly appreciated.

It is also hoped that some good techniques will be turned up for making good yardsticks to measure the value of the design specifications for the SWIFT system.

PRM:pv

cc: All members of the Data Processing
Systems Planning Department



P. R. Mort