This paper was presented to discuss some real world issues in dealing with making the transition from SAS Version 5 to SAS Version 6. SAS Institute has an excellent course that covers many of the details of making the conversion. I recommend that the appropriate support personnel take the course (I did). Many sites are still faced with convincing everyone of the need and timing of the conversion.

DEC Systems
This paper is generally addressed to MVS and VM sites. While some of the issues and planning are pertinent to VMS systems many of the problems noted in the conversion do not exist for VMS users. Many of the extended features available to IBM sites have not been available to VMS SAS users. Thus none of the problems with these extensions are problems for VMS users.

Choices
In the year since SAS Version 6 has become available for mainframe systems there has been a large amount of discussion on when, whether and how the transition will be made from Version 5 to Version 6.

It has been apparent that some of the major choices and considerations are not being made by all of the parties that should be involved: the programmers in the user departments, the management, especially of the user departments and the systems technical staff. Decisions are often made by one group not in consultation with others. The changes between Version 5 and Version 6, particularly for MVS and VM sites, are the most significant changes since SAS became publicly available in 1971 and need consideration by all parties involved.

A simplistic choice is often made to (1) convert all systems to 6.06 now or (2) stay with 5.18 forever or (3) wait for the "next" release, whatever that will be. None of these makes sense except in very extreme cases. Typical reasons given for making one of these choices: "We only allow one version of a software system up at a time," "We can't start testing until next month (year, decade)," "We had no problems with our programs in version 6, so we will cut over tomorrow," "We don't need the new features, so we won't convert". Conversion is inevitable and for most MVS and VM sites conversion will need to take place over a long period of time.

Now, Now, Now.
Conversion of all current systems immediately from 5.18 to 6.06 (as of January 1991), unless the range of SAS Procedures used is very small, is either impossible or unwise. There are still a number of anomalies (bugs) to be corrected in 6.06. There are several design changes that will require changes to existing SAS programs to achieve the current output. This is a nice way of saying that some old SAS code will not work in version 6. There are also significant changes in SAS/AF and SAS/FSP that need to be considered before converting. While these may be small issues at some sites, all existing systems need to be run in 6.06 and the output verified before decisions are made.

Unsupported Procedures
Not apparent to many site managers is the use of unsupported SAS procedures by users at their site. SAS 6.06 will not run any of the unsupported procedures. A new SAS system, SAS/Toolbox, currently in beta test will be required to WRITE new SAS procedures at your site. Note, WRITE, not use new procedures. The currently unsupported procedures exist in three areas: the SAS Supplementary Library Users Guide procedures (SLUG), commercial non-Institute SAS procedures and locally written SAS procedures.

The SLUG is a group of contributed SAS procedures DISTRIBUTED by SAS Institute, but not supported by the Institute. At many sites these are routinely installed with the base system and users are not aware of the difference between supported and unsupported procedures. The Institute has incorporated features of some of the procedures in new or existing 6.06 procedures. It has stated that it may/will include features of other procedures in a future version of SAS and some procedures will/may never be included in SAS in the future. While some sites dismiss the SLUG as esoteric statistical routines, a number of production shops use the DATACHK and ITEM procedures for cleaning up newly entered data. Once used, these procedures are routinely used without reference to a Procedures Guide. Many production systems delete or dummy out the LOG output and never see the admonition that "This is an unsupported procedure."

Commercial procedures include Proc SYNSORT, a procedure sold as an interface to the sort system sold by SYNSort Corporation, the MICS systems from Legent used for systems management and billing, statistical routines from Research Triangle Institute and many others. These procedures are not available under 6.06 (January 1991) and may not be available for another year or more. Again, users may not understand that these are not SAS Institute procedures but come from a third party. The systems staff may be aware of the existence of some of these third party procedures and may be able to provide planning for conversion.

Locally written procedures and CALLED routines are also not currently supported and will require the SAS/Toolbox system for conversion to Version 6. Some of these routines may have been written by staff that are no longer available or may have been acquired on a shareware basis from some other site. All of these procedures may be treated as "required" by the users and they may not be aware of the source or support of these routines.
**Version 6 Datasets**

Version 6 datasets are constructed entirely different from 5.18 datasets. While there are now provisions for having compressed datasets, to save storage space, these may be inconvenient and inefficient for many SAS datasets. Regular version 6 datasets generally require more storage space and on systems with little disk free space this can be a major conversion problem. Datasets can be left in version 5 format and accessed by the majority of version 6 processes, but they will should be converted when the systems are converted.

Discovering the actual use of existing SAS procedures, developing estimates for DASD storage for version 6 datasets and testing all existing SAS code for bugs take considerable effort. All of these need to be considered in the planning and conversion processes.

**Never, Never, Never**

Never converting to version 6, while sometimes suggested, is also not a viable choice. While staying with existing code means not introducing new programmer errors (your bugs) and means you understand SAS Institute’s programmer errors (their bugs), conversion is inevitable. The version 5 system will become an unsupported system in the future and some bugs will never be fixed. Staying with version 5 also means not using the significant number of new and improved methods in version 6. Finally, as more development takes place on other shared systems that are used in your organization (PC’s, workstations, minicomputers and other large systems) there will be limited or no ability to share code developed on those applications to the mainframe. See Style below.

**Wait, Wait, Wait.**

Waiting for the “next” release in some hope that there will be no problems and the Institute will have fixed every bug has all of the worst problems of both proceeding immediately and never converting. In particular, any new development done in the existing version may be wasted, no experience is developed in the new SAS, and a conversion WILL have to take place eventually. Postponing the decision and review process will complicate this work.

**The solution**

The solution is to install version 6.06 now, develop your plan for conversion to version 6, use the 6.06 platform to develop new systems, wait and install 6.087 as the production version and expect to keep 5.18 into the foreseeable future. All parties involved need to understand the need for both systems being available and the costs of doing the version 6 conversion this way.

Proposing the paper a year in advance puts the author out on a limb. By the time the paper is presented, everyone may have already done what is proposed or SAS may announce a NEW and WONDERFUL solution. In this case, as of the final writing of this paper, I still get a number of inquiries about installing version 6 for the first time or WHEN should someone install it.

**Installation**

In an MVS/XA environment the costs of installing 6.06 are the disk space used by the system, 128-256K of the user COMMON space and a small amount of user confusion over dealing with two versions. There are currently no monetary costs for maintaining two releases of SAS. (Technical stuff that can be skipped...) The 128-256K of user COMMON space is the storage needed to install SAS in the Link Pack Area (LPA) of the operating system. This small overhead in LPA is because a majority of SAS Version 6 is stored above the 16 megabyte line and thus has much LESS impact on other users of the system. It is highly recommended that SAS be installed in the LPA even if version 5 is installed in the LPA (...end of technical stuff).

The SAS version 6 procedure (JCL procedure) should be installed with the DDnames provided by SAS Institute. It may be a temptation of systems installers to “help” their users by making SAS version 6 look as much like version 5 as they can, but they shouldn’t. There are new files used by version 6 that will require the user’s attention anyway. In particular, SAS used in most production systems is not used through the catalogued procedures but as part of user procedures. In these cases the procedures will need to be rewritten to incorporate the new files; changing the DDnames associated with the LOG and PRNTN files is a minor issue. If the SAS options are used to retain the old FTSF001 names, some messages and suggestions by the SAS system to the users will reference the wrong names. Conversion of production JCL may be a significant factor in going to version 6.

**Testing Existing Code.**

In moving between prior releases of SAS, testing existing code could be broken down into 2 categories; finding the bugs in the new release and changing the few pieces of code that were in conflict with the new features. The Institute deals with bugs as rapidly as possible and this has improved through the years. New design features usually didn’t impact existing code or were trivial in nature; when real macro programming was introduced, logical IF statements like "IF A & B ..." had to be rewritten "IF A & B".

SAS version 6 is a complete rewrite of the system. Existing code that uses loopholes in the system or that may currently run, but has errors in it, may not work in version 6. More problematic, the code may run, not produce error messages, but NOT produce the expected output.

Many of the statistical procedures have been rewritten to include additional features. As a result the output may be different and certain results may be confusing to novice users. The version 6 documentation is required to make effective use of SAS version 6.

When testing all of your existing SAS code you will find where the unsupported procedures are being used. Some of the SLUG procedure functions have been incorporated into supported SAS procedures. The use of the unsupported procedures can be converted to the new SAS processes (most of PROC FMTLIB functions are now part of PROC FORMAT).
Use of other unsupported procedures will have to be discarded, rewritten or await SAS/Toolbox.

This is also an appropriate time to clean up older code. SAS, beginning in version 5, wants all character strings in the SAS statements to be quoted, including TITLEs, LABELs and user formats. While not required in version 5, you could use the TEXT82 option; this is a good programming practice to quote all of these fields. Implicit arrays can generally be converted to explicit arrays (and improve the logic). Proc SORT is often used unnecessarily by novice SAS programmers and the review can improve the execution speed. Command style macros are not supported in the 6.06 release and will need attention and CALLs to non-SAS functions will also fail. Some older locally written CALled routines may be replaceable with new features in SAS and there are also numerous changes that could be made to improve code using new features (see STYLE).

The last reason to review the output, both the LOG and PRINT output, is that simply scanning your output for non-zero return codes will not find job steps that had problems. Errors that would set the return code to something other than zero in version 5 may have a zero return code in version 6. The log MUST be reviewed for error messages.

Style

Just a few of the new features in SAS version 6 are enough to change the whole methodology of SAS use. They don't require it, they allow it. Access to data and the management of complex datasets, complex merging and subsetting can often be replaced by PROC SQL.

Sorting, data step subsetting and BY processing of datasets may be replaced with WHERE and SELECT processing of datasets. The data engine process and Views can completely change the process of converting all data to SAS datasets in order to use the functions of the SAS system. In the future, VIEWS constructed by programmers will allow access to complex data by casual end users of SAS.

SAS/Connect will replace the uploading and downloading of many datasets that currently takes place between mainframes, minis and personal computers. Data will be placed where best stored, updated, and protected, and will be accessed directly from the other machines.

These and other new features will make SAS much simpler to use, easier to use for complex tasks and directly usable by a larger group of people. The general style of much SAS programming will be very different from current programs.

Screen Control Language is the standard programming environment for developing new AF and FSP processes. SCL is an implementation of SAS and additional features used to develop interactive applications. SAS/ASSIST is a SAS product written in SCL that can provide a menuing interface to SAS for even a computer novice.

The combination of all of these features and more will change many applications from batch reporting systems to interactive-query systems.

Experience is the Best Teacher

(From "Making the Transition to SAS Version 6" course notes.) Even having all of your SAS users take the transition course will not give them the experience of working with the new features. Being able to continue to work in the old environment and write and test code in the new environment allow for the necessary time to discover where the new features can replace older methods.

The new features, new procedures, changed procedures and need to change existing systems demand a transition environment rather than an abrupt change in environments.

Documentation

SAS Institute has completely rewritten all SAS documentation. For any area, there may be as many as five manuals: an introductory guide, a usage manual, a reference manual, a procedures guide and a syntax manual. The introductory guides are like the old primer, the syntax manual replaces the old folding cards (as a 172 page spiral bound book), the procedures guides contain the procedures, the usage guide is somewhere between the descriptive portions of the old User's Guide and the applications manual and the reference manual is a much expanded reference portion of the User's Guide. For some SAS products there is only one manual, for some there are two or three, for the base system there are five.

In the past many SAS programmers shared a set of manuals, borrowed, stole or did without. In many places, users have the Basics Guide but none of the updates that came out as "P" manuals. For version 6, sites should rethink their documentation purchasing and distribution. Lack of adequate documentation will limit your use of the new features and slow any development and debugging of programs. I recommend that a general user have immediately available (current prices):

- SAS Language and Procedures: Usage $16.95
- SAS Language and Procedures: Reference $20.95
- SAS Language and Procedures: Syntax $6.95
- SAS Procedures Guide $17.95
- SAS SQL Guide $7.95

If you use macros

- SAS Macro Processing $13.95
- If you use Tabulate $9.95
- SAS Tabulate (old manual) $9.95
- If you use multiple connected SAS $12.95
- SAS/CONNECT: Usage

And any of the Usage, reference and procedure guides for the other SAS products that you use. For the basic set above the cost of approximately $100 is the cost of several hours of any lower level professional in current business. Not buying manuals is a waste of money.
Each user department should consider using the SAS Subscription service. This will get you all of the new publications within an area for a year. The service for MVS, CMS, VSE for one year is currently $125. The department will then receive a copy of all new publications, will have a least one copy available and can review its need for individual copies.

Interactivity
Always believing that the university environment is slightly behind the times, I am constantly amazed at the number of commercial computer facilities that restrict access to interactive computing.

Interactive computing is becoming the norm expected by users with personal computers on every desktop. SAS version 6 has a new array of tools to enable interactive access to mainframe data. Already mentioned are SAS/AF and SAS/FSP applications, SAS/ASSIST that can be used by novices and used to develop Executive Information Systems and SAS/CONNECT to promote cross system data access.

Beyond those are the existing mainframe SAS systems that are enhanced by interactive computing. Proc REPORT is a new procedure where a report can be rapidly prototyped, examined and finished interactively and placed into use in batch reporting systems. The hours of time wasted, developing a report, submitting it for execution in batch, waiting for output and resubmitting it with revisions can be used for other tasks. Development of new systems by interactive editing and execution can reduce development time from days to hours.

Overhead for interactive execution can be minimized by installing SAS into the LPA. In version 6, running on MVS/XA and MVS/ESA the overhead has been reduced even more by the extensive use of memory above the 16meg line. Increased productivity can easily outweigh the computational costs.

Interactivity needs to be a topic of the conversion process.

Old Code Never Dies
There are some applications or portions of applications that may never be converted to Version 6. If these are a small but necessary portion of your SAS systems, you may want to keep SAS version 5 available for a long period of time (years) after you have converted to version 6 as a production system.

These old code segments can be used from version 6 datasets by: creating a new, temporary version 5 SAS dataset from your production version 6 SAS dataset. You only need to specify the version 5 dataset engine as the output engine. The temporary dataset is then passed to another job step; version 5 of SAS is run against the temporary dataset producing the required output.

After the conversion is made, all base systems and datasets should be in version 6, but access to version 5 capabilities is maintained.

Conversion to Version 6
After installing version 6.06, testing all of your existing applications and determining the incompatibilities, a conversion schedule can be developed. If there are significant problems, you may want to schedule the conversion with the availability of SAS version 6.08.

The interim provides a time for cleaning up old code and determining which systems could/should be rewritten to take advantage of version 6 features.

Initial conversion of applications should be done, leaving the datasets in version 5 form. This allows for either version of SAS to access the datasets during the conversion. Following the conversion of all systems to version 6, the datasets can be individually copied to new version 6 SAS catalogues.

SAS format libraries that need to be shared should NOT be converted to SAS catalogues. Many large systems may simultaneously use system and department format libraries. SAS version 5 format libraries appear as load libraries in MVS and multiple datasets can be concatenated and shared by multiple users. SAS format libraries in version 6 are parts of SAS catalogues and there is currently (version 6.06) no method that allows the concatenation of SAS catalogues. SAS version 6 will use SAS version 5 format libraries. All other datasets and catalogues should be converted to version 6 format.

I expect to maintain SAS version 5 until 1993 (hopefully not later). I also expect that there will still be users of version 5 that will complain when it is removed.

Recommendation
Don't wait and waste time; install version 6 now. Take the transition course so you feel warm and fuzzy about version 6. Thoroughly test all of your applications and involve users from all levels in the conversion timing. Expect to run two systems for a considerable period of time. Move to version 6 in stages and as you feel comfortable with the system.

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