

19 February 1982

MEMORANDUM FOR: Director of Central Intelligence
Director, Intelligence Community Staff
Deputy Director of Central Intelligence

SUBJECT: Project SAFE

1. I am forwarding the memorandum prepared by [redacted] of STAP on his discussions with Government personnel and [redacted] concerning the SAFE project. I concur with his conclusions, options, and recommendations, based on my own independent assessments, having discussed the matter with officials at [redacted] CIA, and DIA.

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2. While STAP through the accompanying memorandum presents two options, it is our firm belief that the SAFE contract should be terminated at once. In coming to this conclusion, we recognize the downside dangers of prejudicing further work on systems that are urgently needed by the analyst. Attempting to save a flawed system by spending two million dollars a month is not a wise investment. Much has been learned from the SAFE experience, but a system whose architecture is based on early 1970's technology is not what will be needed in the late 1980's. A new start, incorporating the lessons learned from SAFE, involving intimate interactions between analysts and the systems architect office based on a contractual arrangement which requires on-site participation by all parties, and which is monitored on a continuing basis by outside experts, is a much sounder investment.

3. In reaching this conclusion, we recognized, as is stated in the memorandum, that considerations other than those of a technical or managerial nature may make termination politically impossible. Nonetheless we strongly urge you to consider termination.

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[redacted]
Chairman

2/19/82

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Page 1

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STAT Memo to: [redacted] Chairman, STAP

STAT From: [redacted]

Subject: SAFE

0.0 ABSTRACT

STAT This memorandum analyzes the current status of the SAFE project, assesses its future, evaluates certain options, and makes recommendations about what to do. The immediate problem is that the current contractor's [redacted] proposal for what will be initially delivered not only is undefined in many particulars, but also is simply unacceptable to the Government; to correct that will surely take both money and time. We must make certain that the SAFE system provided will be as good as possible.

STAT The deficiencies in the situation are that: 1) the designers at [redacted] have never really been aware of the operational environment in which SAFE will work; 2) the design is unfinished in many details, including some important major decisions, like the distribution of functionality between the [redacted] mainframes and the user terminals; 3) the user language reflects almost none of the lengthy detailed work that SAS and CSPO have undertaken -- but note that [redacted] has recently agreed to accept the Government's set of language commands; 4) [redacted] is responding only to the stated STAT requirements, with little appreciation of the demanding jobs that analysts have; 5) it is not clear whether the hardware will support both the projected usage and the planned number of users; 6) it is not clear whether the other design decisions are appropriate.

We recommend that all elements of the design be reassessed by independent experts. If these evaluations are favorable, the

appropriate design decisions should be made to correct known deficiencies and to resolve the many major open issues, and the contractor should be tasked to produce a full Block I capability. Enough time should be allowed for this -- we estimate it will take 18 months more than now scheduled, at least. It will also take more money. The alternative, we recommend, is to terminate the contract, though not the effort to provide analysts with SAFE-like capabilities. Furthermore, we recommend in any event that the Pilot Mail Operation be extended and enhanced.

CONTENTS

1.0	Introduction	1
2.0	CSP0 Concerns	4
2.1	Management	4
2.2	The SUL	6
2.3	System Design	12
2.4	Failure and Recovery	14
2.5	Performance	15
2.6	The Brighter Side	16
2.7	BUT	17
3.0	Other Issues	19
3.1	Pilot SAFE	19
3.2	Human Factors	21
3.3	How Can We be Sure About SAFE?	22
3.4	The Capabilities of SAFE Hardware	23
3.5	The Intelligence Community and SAFE	23
4.0	What has Affected SAFE?	25
4.1	The Underlying Causes: History	25
4.2	The Underlying Causes: People	27
4.3	The Role 	28
4.4	The Role of CSP0	29
5.0	Conclusions and Recommendations	30
5.1	Discussion	30
5.2	Conclusions	33
5.3	Recommendations	35
	Appendix: Glossary of Acronyms	37
	Appendix: Individuals Referenced	38
	Appendix: Excerpts from STAP Options Paper (attached)	39

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1.0 INTRODUCTION

This memo is part of a continuing review of the SAFE project. STAT
SAFE is entering a crucial period, expenditures [] are rising STAT
to over \$2M a month, and the proposed initial deliverable []
seems to be unacceptable to the Agency and DIA. It seems clear
that soon certain decisions must be made about modifications and
delays in the contract that will have a large impact in both
Agencies. Here I discuss the implications of the continuing
problems, especially in the light of the late January 1982
Preliminary Design Review (PDR), which I attended [] STAT
with the cooperation of the Consolidated SAFE Project Office
(CSPO) [] I am grateful to CSPO for making that possible
and was impressed by the diligence and dedication of the
government personnel at that meeting.

STAT The history of the SAFE [] contract is long and complicated, and
I shall not try to summarize it here; there are, however, some
pieces of it that must be mentioned:

- o By now, the presently projected early blocks will have far fewer capabilities than had been originally specified. As costs rose, because of changes, delays, etc., many capabilities were delayed, and some were dropped. This was because the SAFE contract was essentially fixed price, although what was negotiated was cost plus fee.
- o In the summer of 1981, the [] hardware was selected. STAT
Fell 80
- o The Initial Operating Capability (IOC) had always been set for 1 Jan 83; it is now set at 14 Mar 83, apparently as a result of PERT projections. The initial deliverable is now termed 'increment 2.5.'
- o In the summer and fall of 1981, it was becoming increasingly

apparent to CSPO that the contract was in trouble. The aggregate Award Fee Scoring had fallen from about 75 to less than 40 in the 5th 6-month period, and the "overall performance for the 5th period was evaluated as marginal."*

- o In the fall of 1981, partly as a result of that assessment, a significant reorganization of the [] staff was undertaken ("The ritual beheading," according to [] head of the IC staff). STAT
- o In the middle of January 82, CSPO and the Systems Analysis Staff (SAS) of the Office of Central Reference (OCR) learned [] was proposing to supply, with the first release of the deliverable system, a users' command language that seemed to reflect very few of the deliberations that the Government had been sharing with the corresponding group on Language Development [] The functionality that was seen in the proposed release seemed dubious, and did not match what SAS had been discussing. [] called the proposed 2.5 delivery "abysmal", and CSPO in general regarded it as unacceptable. In fact, none of the eventual user languages have been fully specified, and for some, like the analysts' editing language for COMPOSE, [] submitted no proposals at all. STAT
- o The PILOT Mail Operation (PMO), which was one of the successors to the Interim SAFE, has been regarded as successful enough to be considered as worth expanding (Bruce Johnson, ODP), if there are any substantial delays in SAFE implementation. STAT

These and other topics will be explored below. Decisions must be made very soon about what can be reasonably expected for the

*Memo: Point Paper for SAFE Steering Committee, [] (Director of CSPO), 11/27/81. STAT

performance of SAFE, and to what schedule. If there are to be significant changes (and I am sure there will have to be), then the political and financial implications may be very great, and it would be well to be sure about all the projections.

There are many lessons to be learned by the Community from SAFE, and I shall try to discuss some of them. Many of them are far beyond the responsibility of the current participants in SAFE, and, indeed, some deal with the entire nature of the relationships between Government and Industry in large and complex purchases like this one. Sometimes it must be appropriate to delegate the responsibility for overall and detailed design of a large and complex system, but it was not for SAFE. We will discuss this point further in section 4.

But the most important recommendations are those that concern the immediate options that the government has. The need for a SAFE-like capability is enormous, and I believe that it would be a devastating loss to the Community should the effort to achieve it be abandoned. The question is how to redirect the current thrust of the effort so that the best capabilities can be provided to the Community as quickly as possible. That will mean a speedy inspection of the proposed SAFE system in its current condition to make sure that it can become the basis for those capabilities; or else a study of how best to use the lessons learned.

One of the difficulties in making recommendations is that there are very many factors and design decisions that have not yet been made, or at least been agreed upon, by both the contractor and the Government. For example, one of the fundamental capabilities to be provided to the analyst by SAFE is COMPOSE,* which deals with the building of a document to be produced as a finished

*There are four major capabilities that SAFE should provide: 1) receive and distribute cable traffic; 2) create and maintain analysts' own files; 3) search SAFE files; 4) write or compose reports etc.

piece of intelligence -- including editing, formatting, etc. Almost nothing about COMPOSE has been agreed upon. Indeed, the contractor has not even made serious proposals about what it might include, and neither has the government proposed a truly firm set of requirements to be discussed with the contractor.

At best, SAFE as currently forecast by both the contractor and CSPO will fall far short of what was originally envisioned by those responsible for its initiation, at least in the current contract. I believe that it is important to keep the vision alive, both as a goal to be striven for, and also as a key to keep us from accepting as a frozen design something that will not let us reach it.

2.0 CSPO CONCERNS

There are a number of concerns that worry CSPO now; some have a long history, and some have arisen only recently.

2.1 Management

STAT CSPO has always tried to ensure that it maintained control over communications [redacted] it established that any contact with [redacted] had to be made through CSPO. One problem that followed from that rule was that it was very difficult [redacted] to observe the STAT analysts working in their own environment on their own problems, so that [redacted] of what it was that analysts were doing was derived from the words in the specifications for SAFE -- and the specifications are not finished yet. It is apparently also true that [redacted] did not insist either in their proposal or so far during the contract that such observations were essential not only to good human factors but also to a good balance of the STAT functionality and the resources in SAFE with respect to present and future usage.

STAT One healthy change in the CSPO viewpoint about management was to require [redacted] emphasize modifiability and flexibility in the hardware configurations and programming; so that when changes and modifications and extensions become clearly desirable, there will be but little trauma and interruption in making them. I am not sure to what extent this requirement has actually been put into effect, and that point should be carefully checked.

The management of large and complex systems, especially when they involve software, is always remarkably difficult. Indeed, the acquisition of large software systems is probably the least successful of government contractual exercises.* CSPO early established an evaluation technique for this large contract (ca. \$75M) called Award Fee Scoring:

- o Technical Performance 50%
- o Management 25%
- o Schedule 20%
- o Security 5%

25X1 In the Point Paper, [redacted]

"Overall performance for 5th (six-month) period was evaluated as marginal.

- . Problems outlined in previous evaluations persisted with predictable results
- . Management was aimed primarily toward gaining technical control -- ongoing activities were marginally managed.
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*See, for example, the Final Report of the Software Acquisition and Development Working Group, Chairman [redacted] prepared for 25X1 the Assistant Secretary of Defense for C²I, July 1980.

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Management and organizational changes late in the period place competent management in several key positions; results should be evident in upcoming periods." (ibid, p. 3)

It seems clear from that statement that CSPO believed that the management and organizational problems [redacted] on this contract were of long standing. Indeed, in the final minutes of the PDR, [redacted] (CSPO) spoke of "knowing what the problems are," and [redacted] that "the level of uncertainty is down; [redacted] had told [redacted] that the "SAFE Project is back on track."* A tough manager, [redacted] had been named in late September as Deputy Project Manager for Engineering, and seemed to be more effective.

Much of the reassurance that CSPO was expressing in December was due to the PERTing [redacted] had initiated less than a year previously (chiefly as a result of pressure from CSPO), so that [redacted] could report that the "Contractor (was) finally achieving detailed planning necessary for control and management of software development." (Point Paper, ibid, p. 5)

That reassurance was badly shaken when the SAFE User Language (SUL) [redacted] proposed to incorporate in the first release (increment 2.5, now scheduled on 3/14/83) was evaluated by SAS in 1/82 as totally unacceptable, as I mentioned above. Furthermore the functionality underlying that language, and which was the rationale for it, seemed dubious indeed and not responsive to the user needs as they had been stated. The next section will discuss those topics.

2.2 The SUL

*TRW. "The SAFE Project,": Briefing for [redacted], 1/15/82, chart 3.

STAT [] in the matter of user languages has been almost entirely through the SAS/CSPO User Interface Working Group (UIWG), which had believed that steady progress was being made. As late as 11/81, the SAS reported that

"(in order) to assure an orderly introduction of SAFE into NFAC on 31 December 1982 ...

"The User Language Specification (ULS) is to be in final form by the end of CY81."#

In the middle of January 1982, a CSPO/SAS technical team reviewed SAFE documentation for the SUL. There had been essentially three languages proposed:

- o The government version, basically worked out by the SAS/CSPO UIWG; a functional set of commands. Many of them had been delayed for later blocks as costs rose and delays occurred.
- o The language team [] had been working with the Government, but was much more concerned with the problems of implementation. For example, a key problem in designing SAFE is that both the [] CPU's and the DeltaData terminal (7260T's) are capable of many of the functions required; how to separate the responsibilities so as to maximize the performance was of much more concern [] than to the Government. This led to different emphases and different solutions to many problems.

#PUC No. 13, "The Plan for Implementing SAFE in NFAC," 11/4/81, p. 4.

- o The System Development team [] was deriving language specifications from the functional analysis of the CPU capabilities. STAT

The CSPO/SAS discovered by studying the commands that the third team was in effect the winner. [] had stated that the design was frozen. It seemed to SAS that the third team had had little or no communication whatsoever with the second, the language team, and none with the first, the Government. They felt that they had worked for years to no effect at all. The large experience with PILOT Mail had been totally disregarded. [] evaluation was that the language and the functionality of 2.5 were "abysmal," and CSPO in general has rated the proposed deliverable as unacceptable. STAT

Those are strong statements, but I agree with them, and I include a couple of examples to justify them.

- o In the proposed delivery, the user deals with his files only through DISPLAY, which is the fundamental operation. This is a design decision that has far-reaching ramifications -- that the fundamental operations functionally deal with a 'screenful' of information. That is, the user's concept of the system should be that he is always dealing with a screenful of information. The user can delete a file only by inputting 'delete' for every record in the file after he has summoned it to the screen. A file, of course, can contain a very large number of records. If a user wants to print out a file, he has to go through the same exercise with 'print':

"PRINT

1. A single record at a time from a display file may be printed.

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2. Files, parts of records, etc., may not be printed. Therefore, no ordering, starting at, etc.
 3. No COPIES parameter. (i.e., there is no parameter that enables a user to print a number of copies.)
 4. Printing of related records which are displayed together is possible using the right output forms.
 5. Special printer characteristics cannot be specified (e.g., font)."
- o The Command Procedures (essentially macros that allow the user to run sequences of commands with a single command) were to be implemented, but without the features that gave them any of the powers needed -- no parameters, for example. This is significant because the command procedure would allow over-riding of the restrictions discussed in the preceding item; a properly written command procedure could delete every record in a file with a single simple command.

Inputting a command sentence consists of typing a command followed by a number of parameters that tell SAFE things about how the command is to be executed. The ways that the parameters are expressed and ordered or punctuated are called the syntax of the language. The syntax makes a large difference in the convenience of the language to the user; compare the following three versions of commands that cause a file named BERLIN to be printed on a line printer in the usual format named FORM1:

PRINT BERLIN

PRINT BERLIN, LINEPRINTER, FORM1

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Internal Memo: "Comments on Customer SUL Letters of Direction," to Distribution, from Hagerbaumer, Breisacher, and Almeida, 1/8/82, 82.35656.77-004.

Approved For Release 2005/07/12 : CIA-RDP84-00933R000500120004-2

Approved For Release 2005/07/12 : CIA-RDP84-00933R000500120004-2

PRINT FILE=BERLIN, DEVICE=LINEPRINTER, FORMAT=FORM1

These command sentences, properly interpreted by a subprogram that might be called the Command Interpreter, all mean the same thing. # The shortest one, the first, assumes that the user has established the lineprinter as the DEFAULT device, and the format specification FORM1 as the default format. In fact, proposal for the initial SUL syntax seems to look very much like the third version.

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Syntax is a complicated subject, but it is obviously crucial to the analysts' usage of a system. The third version takes more than four times as many keystrokes as the first. The use of default values for parameters is a key issue. Sometimes parameters have to be entered in a predetermined order, and that too can be burdensome to the user analyst.

There are other restrictions for the user to bear:

(Gov't question:)

"Is the version number incremented when a "file" action takes place or when a user calls up an item to be edited:(sic) The record is 'copied' when routed, will this be a new version? Can a user request to see "latest" versions or must he specifically name the version? When the user sees the status of a compose file will he see both item name and version number? Does the user have the option of replacing a record in lieu of creating a new version?"

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response:)

"Version number is incremented when an item is edited.
The record is copied when routed.
Version number is associated with the routed record."

#Of course, in the proposed deliverable no such commands would be usable at all, since they call for a whole file to be printed in a single command.

"The user must specifically name the version.

The user does not see both item name and version number (no version mark). The user does not have the option of replacing a record in lieu of creating a new version."*

That means that the user analyst must remember a version number and type it in for every file transaction; this would be a trivial programming task to get the computer to do. It would to my mind be insufferably burdensome to the user.

The number of restrictions of usage placed on the analyst is far too large to be acceptable. Furthermore, of course, they should be checked in the context of reasonable actual usage -- the PMO is the ideal place to make sure that the projections are reasonable.

My judgment is that CSPO is correct in deeming that the extra burden and restrictions placed on the user analysts [redacted] proposal are unacceptable in a delivered system. The fact that these restrictions derive from a functionality means that they are not merely cosmetic, and hence fixable, but instead reflect real trouble with the design.

I go on at some length about these topics because they show the extent of the communications disconnect between the Government needs and the contractor's interpretation of them. The 2.5 release as proposed at the PDR is not acceptable to the Government, [redacted] has agreed (as of 2/19/82) to improve its first release. In fact, it is my understanding that [redacted] recently accepted the entire Government position on the SUL. The underlying issues of design in support of it are far less clear, however.

[redacted] Response to Gov't. Comments on Data Base Definition Document, 1/25/82, at the PDR.

2.3 System Design

One of the most distressing aspects of the current status of SAFE is encompassed by the following comments made at the end of the PDR:

- o "The system design is not complete" and there are still "open areas." [redacted] PDR, 1/28/82)
- o "The design must be subject to validation." (ibid)
- o There are real concerns about the "delivery of 2.5 and its viability in the users' hands." (ibid)
- o There are still "substantial system issues ... [redacted] [redacted] PDR, 1/28/82)
- o The system design is "not yet quite right." (ibid)

It is now less than 14 months from the scheduled delivery of the IOC. The design uncertainties exist in many fundamental functions that SAFE must perform, not just in the SUL, discussed above:

- o In response to Government comments about procedures for Applications Software, [redacted] response was:

"We plan to update this level of information as we move into detailed design activities. As the detail (sic) design is completed, it will be reflected (in the) documentation."*

- o [redacted] "The micro sequence array (of MICROSEQ) contains execution steps and parameters associated with the execution

[redacted] Responses to Gov't comments on Product Specifications for Applications Software, PDR, 1/26/82, p. B-023.

steps. The details of the structure and contents are still being defined and should be resolved shortly."#

STAT o [] "As the units and procedures (in the UIS) are completed through detailed design, the detailed work messages and subroutine calls will be reflected ..."*

STAT o [] "The detailed design of micro generation is not yet complete ..." (ibid, p. C-022)

o The DeltaData 7260T is still under development; the function keys and the documentation are both unclear.*

STAT o [] "Major SAFE C Design Issues:

- . Performance ...
- . User Language
- . Failover(sic)/Recovery
- . Operating Modes
- . External Systems ..."#

o The only well-established text editor now available in SAFE for the proposed delivery is the one provided by the DeltaData 7260T terminal; "this is not acceptable as the sole text editor for SAFE," [] CSPO, at the PDR).STAT

o It is well known in large user-oriented time-sharing systems that for most of the time the computer is engaged in interpreting and carrying out commands that essentially have to do with organizing and executing editing. As we remarked above, there is no editing language well enough specified

#ibid, p. B-031.

STAT [] Responses to Gov't. Comments on UIS Product Specification,STAT
PDR, 1/26/82, p. C-010.

*Discussions at PDR, 1/28/82.

STAT [] "The SAFE Project," Briefing for []
STAT [] 1/15/82, chart 25.

Approved For Release 2005/07/12 : CIA-RDP84-00933R000500120004-2

for inclusion in SAFE. Note that ODP, whose current widely used E-language is X-EDIT, has for some time been deliberating about the upgrading of that to one more sensitive to users' needs and to the increased capabilities of modern systems. ODP has now actively embarked on developing a modern scree-based E-language.* At the PDR, there was no evidence that such deliberations were being received and considered

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It should be remarked that these are not the modifications and "tuning" that devolve from a system's being put into practical operation and then adapted to actual as opposed to projected use. No large piece of the SAFE hardware and software has actually been tested. If there are therefore many fundamentally unfinished design issues in SAFE, how realistic is it to propose an IOC date of 3/14/83? I do not think it is realistic at all, and I have not found any experienced system analyst who thinks it is, and CSPO seems to agree. The point is that SAFE must work reliably -- far more reliably than just well enough to correct bugs and to adjust some software and rewrite others.

This skepticism is separate from the problems arising from an unacceptable SUL. I shall return to it later in this section.

2.4 Failure and Recovery

Failure (in the documentation it is inexplicably referred to as 'failover') must be a key concern. Every computer system can find new and thrilling ways to fail, but SAFE must protect its contents and its users with an unmatched reliability. Since SAFE is large and complex, there are many things that can go wrong.

itself has recognized that how to handle failures has still

*Personal communication, Bruce Johnson, ODP.

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to be resolved. It is a "Major SAFE C Design Issue."* Failures can result from caprices of hardware or software, and since neither has been fully designed, it is not easy to project the kinds of failures that will occur. History assures us, however, that they will. Not only have methods for handling failures, including, of course, recovery from them, not been specified, but the design requirements have not even been written except in the most general terms.

2.5 Performance

The performance of SAFE has been projected with Performance Analysis. "Performance Analysis is the primary vehicle ... to verify the software architecture." [redacted] PDR, 1/28/82) This STAT requires the "appropriate models," and "all tests and benchmarks" are performed on the models. The models are built -- indeed they have to be built -- using scenarios of projected usage.

STAT Now that is curious. First, SAS tried unsuccessfully for 18 months to persuade [redacted] to produce in the form of scenarios their notions about what SAFE would actually do for an analyst. Second, the scenarios used for the (computer-based) models are not current, but are based on data three to four years old. Third, the scenarios, and the other assumptions underlying the models, take no advantage at all of the experience the Government has had with PMO.

The computer-based projections do not seem unreasonable, given the vaguely communicated notions of usage, and supposing that there will be no major changes in architecture. They show that the first release will in several ways not satisfy the requirements without certain modifications and improvements, STAT

*The SAFE Project, A briefing for [redacted] 1/15/82, Chart 25.

which are now being planned for (of course, they cost extra). In the most favorable projections, with the improvements, the margins become small and mostly positive. We discuss this point further in section 3.4.

STAT To a certain extent, that is all to be expected; at the end of the PDR, [] said that "the performance problem is no surprise." It must still be remembered, however, that the projections come from simulations.

2.6 The Brighter Side

The CSPO spokesmen profess to be encouraged by what they learned at the PDR:

STAT o [] "The Government does understand the state of the program ... an ambitious project plan."

STAT o [] "The level of uncertainty is down," and "we need to wrap up the findings, to finalize the design."

STAT o [] the senior DIA representative on CSPO, said he was delighted.*

These optimistic reactions are perhaps de rigeur at the end of a PDR. Of course, they are understandable after four days of grueling reviews and active, sometimes acrimonious, discussions; and for many of the Government personnel, I know, the work extended far into the night.

*The PDR was chiefly directed at the C system, for CIA. The D system for DIA is different in many ways, but also similar in many; the exact commonalities have not yet been fully determined. In any case, the D system will be delivered a year or so later than the C.

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2.7 BUT

STAT The question to me is whether any optimism is justified at this time. If "management was aimed primarily toward gaining technical control," (p.5 above), what had they been doing for the previous 24 months of the contract? Should one believe that they could now do better than they had earlier? What had CSPO been doing for those 24 months?

I will put it strongly:

- o We are less than 14 months from the scheduled delivery of a system that is rated unacceptable. As of 2/19, there is apparently agreement that that delivery will not be made; no other delivery date is firm.
- o The design is incomplete.
- o There are many serious issues to be resolved.
- o No substantial piece of programming or coding has been done, let alone been debugged, tested and used. (Note that this is not somebody's fault -- it was specified in the contract.)
- o The user languages are undefined, so that documentation and training are up in the air.
- o The known experience with PMO, the only extant system with similar requirements and actual performance in the real operational environment has been ignored by the contractor, or not been made available to him.

The situation is even worse than that. In some environments, like a University or an R&D establishment, users can tolerate inefficiencies and failures -- some of them might even enjoy the

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interactions that can help develop a viable and productive system. I do not believe that that is true of the CIA or the DIA. The DDI analysts (and the other ones too) that I have met are interested in finding the best ways to help them do their jobs, wickedly demanding at best, and they are not at all interested in helping a project that for many is alien to their experiences and their tastes. That means at least:

- o SAFE must visibly and immediately work: it must do things for analysts that they want done; it must change how it does those things to satisfy different analysts' different needs, even frivolous ones; it must incorporate and exhibit decent human factors; it must tolerate human errors gently and supportively; it must provide ways to recover from its own failures, with no loss (not minimum loss) of data, and with no loss (not minimum loss) of security.
- o SAFE must work all the time: that means 24 hours a day, every day in the year; it must be tolerant and adjusting -- for example, if a CPU fails, another one should take its place automatically; if a terminal fails, the user has to be able to move to another and start over where he left off; if a user cannot remember how to perform a function, it should assist him on-line.
- o To its users SAFE must emanate feelings of adjustability and of the possibility of unbounded improvements in response to them. If users don't like something, or if they reasonably demand another feature, they should feel that SAFE will react positively to them; SAFE should also be generating new capabilities for testing and applying in the marketplace of intelligence analysis and production.

The 2.5 increment planned for the first delivery is clearly not that SAFE, currently negotiated by the Government

STAT

3.0 OTHER ISSUES

Nearly two years ago, STAP discussed the SAFE project in memos to the DCI, expressing certain concerns and making certain recommendations. Some of those concerns have been alleviated, but some are still with us; some of the recommendations have been followed, some not. In this section I shall discuss the topics we discussed then and their relevance to the current situation in SAFE. The key document is "Options for SAFE," STIC 80-002, from STAP.

3.1 PILOT SAFE

STAP made a strong recommendation to upgrade Interim SAFE toward a system that would perform as much as possible like what was wanted from SAFE.* To a very significant extent that recommendation was followed, and the result has been the development of the PILOT Mail Operation, PMO.

STAT PMO has already provided some interesting and relevant lessons. According to head of SAS, whose responsibilities also include running PMO, "the usage, number of terms used (in SEARCH profiles), the number of operations and commands used by analysts, are all far higher than we anticipated... and we learned some things that we can't do anything about for the early SAFE releases."# Here are some other comments:

"Two months ago we installed the SAFE PMO in (an OSWR Branch which) has already obtained significant benefits (including

*The relevant portions of the STAP Options paper are attached as an appendix.

#Discussion at CSP0, 12/4/81.

an) ability to quickly and efficiently create branch files which are consistent, non-redundant, and accessible to all...The branch is quickly getting messages on the day they were sent rather than the several days (2-3)... via the hard copy/registry route"*

"The A-Specification states that each SAFE mail file will receive an average of 17 electrical documents each day. Our experience in PMO...suggests that a more reasonable daily average of mail received is 105 documents...

"The A-Specification states that a mail profile will contain 50 terms on the average, PMO experience suggests ... that the average number of terms per profile is 111."#

"... imbedded, leading, and trailing "don't cares" are all used in the PMO profiles. We see the continued use of the "don't care" capability in SAFE at the same high rate as in the PMO.

"... 50% of the terms are unique within an office...especially...within the five ... regional offices. In nonregionally oriented offices, the incidence of unique terms is as high as 90%."*

Here are some questions# that ought to be answered by Pilot SAFE:

1. What are the usage patterns of naive users?
2. What are the usage patterns of experienced users?
3. What needs for modifications of SAFE performance become

*Memo from Director, NFAC, to Comptroller, CIA, 6/19/81.

#Memo from Chief, SAS, to Director, CSPO, 11/6/81.

*Memo to Director, CSPO, from Chief, SAS, 1/7/82.

#From STAP Options for SAFE, pp. 6-7.

manifest from the transition of naive users to experienced ones.

4. What are the user documentation and training requirements?
5. What new requirements emerge from the experienced usage?
6. How should the services provided by SAFE be modified to take advantage of new technology?
7. What facets of the system can be safely frozen in design concept? What parts must be carefully engineered to retain flexibility of function and performance?

It is still true that PMO does not undertake at present to explore the other capabilities that SAFE ought to have -- the full range of the other three functions, mentioned in the footnote on page 3. It must be expected that the projected usage of those functions will change with experience too.

3.2 Human Factors

STAP recommended a broad human factors study of what it is analysts do:

"Further, ... we reiterate the urgency for a very general human factors study of intelligence analysis and the behavior of intelligence analysts."#

Indirectly, the PMO is providing valuable data itself. But that information, of course, valuable as it is, goes but a short way towards the goals we were talking of. Our points then are as

#Options for SAFE, p. 11. Note that the footnote in the quote (not cited) itself noted that the point had been made many times before. The emphasis was in the original.

valid now, I believe. A study initiated two years ago would by now be contributing to many of the design decisions being currently negotiated by the Government [] just as the PMSTAT study now can.

There are still many human factors issues in SAFE that do not reflect the state of the art, and that ought to be examined for application in Pilot SAFE. Some of them were mentioned a year and half ago in a memo to CSPO from STAP, 8/6/80, Subject: SAFE Project User Language Specifications. I intend to review that document with the Government people again soon.

3.3 How Can We be Sure About SAFE?

The SUL and the functionality of SAFE were the issues on which CSPO and the SAS spent disproportionately much time and effort. It is clear that those efforts will have been of little avail without a lot more work and pressure [] Many other parts of STAT the SAFE project have in effect been taken on faith. Examples are

- o The Data Base Management System (DBMS)
- o The InterComputer Communication
- o Structured File Processing
- o CPU Capacities

STAT Note that I am not alleging that there are any deficiencies in the [] work on those topics. It is just that the Government ought to be in a position to be sure by its own examination of the actual machinery and the data on its use. It is possible, indeed likely, that the expertise does not exist within CSPO for some topics, like DBMS. Given the most crucial nature of the DBMS -- it will freeze many future choices and options for a long time -- CSPO ought to consider putting together an ad hoc panel of experts,* and STAP would be delighted to suggest members.

3.4 The Capabilities of SAFE Hardware

Another worrying aspect of SAFE is the capacity of the CPU hardware under reasonable and anticipated operating conditions. Discussions that [] had with [] personnel suggested that a single mainframe can handle at most 35 users, and 15-20 would be a more reasonable figure for active users. The current CSP0 [] plans call for 100 users per mainframe. It should be pointed out that the design is not far enough along that that figure of 100 should be regarded as frozen; furthermore, a certain amount of work for the user can be performed by the DeltaData terminal. As before, this is such a crucial factor that it would be worth an independent check. It should also be pointed out that the [] hardware is totally incompatible with all the other mainframes used by the Agencies.# The application of an independent panel of experts to evaluate this problem should be considered.

3.5 The Intelligence Community and SAFE

There are some aspects of SAFE-like support that ought to be borne in mind, even though they are deliberately not planned now to be a part of the SAFE capabilities. Although the present concern of Community management must be the short-run decisions about the optimal course for SAFE, STAP believes that there are some long-run interests that should affect design and utilization decisions.

SAFE is not now scheduled to be a Community-wide resource, even though it will supply services to two Agencies. The D system will have ports into COINS# (a very few, just two, I believe); but

*Such ad hoc panels were recommended in the STAP Options paper.
#Personal communication, Bruce Johnson, ODP.
#COINS, Community Online Intelligence System, is a very large

those will be enough to gauge their value. Adding more of something that is known to work and work helpfully is always far easier than to try to add a completely new feature. STAP believes strongly that a SAFE-like capability will form almost the cornerstone of this country's intelligence processing in not too many decades; and that, furthermore, that capability must enable the analysts to take advantage of all the data bases, collection techniques, processing powers, and so on, to which the Community has access. Actually, CIA has had two COINS terminals in the library, I believe, for more than ten years, but users find them awkward to use, little training is provided, and there is minimal encouragement from management.

STAP concludes that it is vital to start now to find out how to give SAFE these greater capabilities. We suggest again that a reasonable way to begin is to provide Pilot SAFE with ports into COINS. It will be necessary:

- o To explore and decide on the proper security rules, including terminal access, file access, audit trails, and communications security. Note that COINS already has its own solutions to most of these problems.
- o To experiment with some form of gateway to control access and communications. Note that COINS has had much experience with gateways, and for their purposes the wrinkles have been ironed out.
- o To begin to study accessing data bases with different access languages and protocols.

network of intelligence and C3I computers with its central node and control at NSA. It was started about 15 years ago, and originally had only 3 or 4 elements, including the CIA and the DIA. The Director has been and is It carries data STAT at all levels of security.

The current plans for SAFE propose that there be no online access for SAFE users for data bases outside SAFE, and no access at all for outside users into SAFE data bases. We hope that these plans will be modified. We suggest, and in fact recommend, that the Community commit itself to providing analysts throughout the Community with carefully controlled access to all the data bases it owns. Obviously some need very circumspect access indeed; but we should be learning how to do that right, instead of trying to avoid the issue. There have been no studies that suggest that that task is somehow inherently impossible. COINS experience suggests that it can be done.

4.0 WHAT HAS AFFECTED SAFE

The SAFE project is in a bad way. I do not believe that the fundamental SAFE capabilities -- represented, say, by Block 1 -- can be provided without a very substantial delay beyond the current schedule. Even if Block 1 capabilities are provided, how can we be sure that we can keep the other blocks moving ahead, and keep on providing capabilities for the future requirements?

It would be too simple to think that once the surface disturbances have been smoothed over, the SAFE Project can be considered rescued and "back on track." The difficulties with the language, the SUL, are upsetting enough in themselves, but they represent a fundamental failure of the design process, and that goes deep indeed. We should not be tempted to believe that once that is fixed everything will be all right.

4.1 The Underlying Causes: History

The SAFE project has a long history, and many people have contributed to the decisions from which the present has arrived.

STAT Some of the decisions seem to have been made almost casually: as part of the contract, [redacted] provide a "Phased Implementation Study," to recommend providing the capabilities in steps instead of all at once. Therein may be read:

"2.1.6 Development Methodology Changes

Schedule compression resulting from (delays) causes several modifications to the development methodology;

- 6) To help relieve schedule compression, user language prototyping will not be performed.*

That speaks for itself. Other items slipped in similar ways. For example, the ability for an experienced user to 'slave' his terminal to another's is invaluable in enabling one user to help another with his problems online. Yet an initial requirement for such a capability vanished along the way, and was scheduled to be implemented in segment 6, some unspecified time after the IOC. # Similarly, performance tools, simulation and optimization tools are delayed indefinitely.

In some real sense, we should talk about the causes for this situation only in order to try to correct the inadequacies that have led to the present situation. In late 1976, a memo was sent to the Chief, Special Projects Staff, ODP, containing comments on a paper entitled "SAFE Design Concepts." It stressed the dangers of assuming that one could write then the functional requirements for a system to be used far in the future; it noted that analysts don't know what to ask for if what they are offered is outside their experience, and that the system itself, if successful, would inherently change patterns of usage.

25X1

[redacted] "Phased Implementation Study Final Report," [redacted] p. 20.

#See *ibid*, p. 51, fig. 3-15, under "teleconferencing."

STAT
25X1

25X1

The difficulties of SAFE arose through the nature of the needs and the processes by which the project was initiated, the contractor selected, and the contents of the contract specified. A project like SAFE is 1) very large, both in hardware and in software, 2) very complex in capabilities, structure and function, and 3) interactive with many users. In fact, nearly all large software systems acquired for the Department of Defense suffered from cost and time over-runs, often extreme.* Especially because we did not know exactly what the users would be wanting to do, it would seem to be advisable not to try to purchase a single system to 'do the job.'

Rather, not too much new should be attempted in each increment of capability or function; and each increment should be evaluated in operational conditions and integrated with other components. The users -- the analysts -- must be active and contributing participants. These considerations should be explored carefully, and they suggest a form of acquisition of capabilities that is very different from the current SAFE contract.

4.2 The Underlying Causes: People

The people who work in the Intelligence Community are by and large diligent, competent and dedicated. But there are few among them who represent excellence (but there are some) in the forefront of computer technology; that is exactly one of the resources needed in managing and controlling a project like SAFE. Indeed, many of us can remember when the Intelligence Community in fact supported the state of the art -- Project Lightning, for example, moved computer technology ahead five years in one stroke.

Manifestly, the need for real state of the art experts in the

*The SADWG report, V.E.Jones, ed., *ibid.*

technologies that are so much a part of intelligence these days
's not unique to SAFE; but there it applies especially, because
the
tasks that SAFE is dedicated to are not 'glamorous' in the same
way that space reconnaissance or molecular beams are. One result
for SAFE is that questions about implementation or design tend to
be answered by the contractor alone, and then imposed as it were
on the Intelligence Community. Even if there are experts inhouse,
the bureaucratic environment tends to deaden their ambition,
because apparently so little can be done.

?

STAT 4.3 The Role of [redacted]

STAT It is puzzling why [redacted] seems to have ignored the real needs and
directions of SAFE. SAFE is not that small a contract, the
Intelligence Community is not that unimportant, even in the
context of the military industrial complex [redacted] has some very
bright people working for it, some even brilliant. Why were none
of them assigned to help SAFE?

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Even today, other questions remain: if a tough new manager, [redacted]

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STAT [redacted] is assigned to be Deputy Project Manager for Engineering
STAT under [redacted] why did she accept a PDR date with so many
undecided items? In fact, why was the proposed user language
unacceptable? -- both language groups were working for her. If
the COMPOSE facility is essentially totally undefined as of now,

STAT [redacted] had four months to find that out. Of course, [redacted]
had thirty.

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STAT The point of these comments is primarily to raise the question of
the suitability not only of the management structure, but also of
the particular personnel. If we are going to expect improvements
from [redacted] the way they handle SAFE, we must inquire why we
should expect the people now to do better than they have done
already.

Competent managers in computer technology have a hard row to hoe. They must be aware not only of the people and tools they deal with, but also of the bounding technology itself and its peculiar demands and constraints. The managers should have said -- and they should be saying now -- that they and their engineers and systems analysts need to observe actual intelligence analysts working in their tasks, that they need to try operational experiments to tune their system components before putting them together to form the bigger system.

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These comments stress that [] itself must exert more leadership in the direction of SAFE than it has been doing. At the PDR I heard several times in response to questions about SAFE capabilities that [] was going to meet the requirements. It is part of [] responsibilities to see that they also provide a system that does the job, even if a contract cannot be written to say that in contractese.

4.4 The Role of CSPO

CSPO also has a tough job. Somehow the technical strengths to gauge and evaluate a proposed system have to be produced and applied where they will count. As I remarked above, there is little reason to be satisfied that the uninspected pieces of design for SAFE are in fact acceptable, since so many of the [] people do not seem to understand the operational context that SAFE must work in. STAT

In fact, the contract was initiated with strong restrictions imposed on CSPO's freedom of action. It was determined elsewhere that DIA and CIA were both to be customers on the same contract, though their needs are very different. Other requirements were laid on CSPO: contractor communications were to be funneled through them, and controlled by them; and the details of the

contract were by and large imposed on them with little recourse. In retrospect, these restrictions were a significant handicap on CSPO's ability to manage and control.

But CSPO must also be assuming more leadership in where SAFE is going as a whole. Leadership is a hard thing to define: it does not have to be concentrated in one body, though it often is; it does not have to know every detail, though it often knows many; it must have the ability to inspire and excite, to raise levels of ambition, to bring large pictures to workers at the level of detail. CSPO does not have that kind of leadership now, and it needs it.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

The problems discussed in this memo are not easy to solve. It would be perhaps tempting to regard the money and the effort spent so far as an investment that has to be protected with more money and more effort. Indeed, [redacted] at DIA asserts that because things have not been going well we should be prepared to do just that: STAT

"Several major design and technical issues remain... The false start and delay ... has (sic) cost at least \$5 to \$6 million in effort and a slip of at least 9 months... [redacted] currently (and, we think, optimistically) projecting an IOC for the DIA Block 3 in September 1984... The costs to complete ... are estimated in [redacted] project plan to increase \$12 million ... STAT

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[redacted] on behalf of senior [redacted] management ... does now recognize that costs would be increased and the schedule extended from the original plan... most new technical personnel are just completing the learning curve...

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[redacted] is working with [redacted] to modify the operating system software ... both companies also met ... to assess the ... yet unannounced new [redacted] hardware ...

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"Conclusions and Recommendations: The difficulties encountered ... are not extremely unusual. [redacted] has gone through a difficult learning curve .. but now desperately needs continuity... We strongly believe the present project management ... should be supported to maintain project continuity."*

STAT

The argument can be carried logically to: the worse a contractor does, the more he needs extra support, understanding, and continuity. The memo emphasizes that the Government does not really know where it stands, and that there is real risk for the Government whatever it does:

"Even under this schedule there is considerable concurrent software development... it increases the complexity of the project and the uncertainty that the whole system will work when all software is integrated. The risk here is schedule and cost more than performance."#

But there are obviously limits to the most tolerant contract management. Supposing it turns out that most of the elements of the system design are badly flawed: are we really prepared to keep injecting more and more resources? As we saw above, the hardware is not settled, and there are major design issues. How

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*Memo for [redacted]
DIA, 1/12/82, U-01/RS.
#ibid, p. 3.

can the Government know what the performance can be?

That is to say, there is some level of assessment of the current state of SAFE which would lead to a recommendation of cancellation of the contract. The consequences would be deeply disturbing and traumatic to the Intelligence Community. The CIA has been counting on SAFE strongly enough, but there are other viable efforts that can provide some avenues for support for the analysts. But DIA lacks those other avenues almost entirely, and interruption in progress toward SAFE-like capabilities would be catastrophic. SAFE has been ten years in its planning and organizing; one would not like to have to wait another ten.

Since a profound evaluation of the actual current state of SAFE seems to be essential to rational decisions, we recommend that it be done. It would seem appropriate to have that evaluation done by experts who have not participated in the operation or management of the project so far, even if merely to add weight to their credibility.

We can see a range of possibilities:

1. The evaluations are strongly negative; in spite of the negative consequences, the contract should be cancelled, the pieces picked up as well as can be done, and the efforts restarted. It must be remembered that the Community's needs are still there. It is possible that commitments have been made that require salvage of the work contracted for; the labor needed for that might be large, but it should not be allowed to impede the recommended enhancements of the ongoing PMO and other expressions of the drive toward the capabilities that the analysts need.
2. The evaluations are strongly positive; once the SUL problems have been solved, there is every reason to expect that the design will lead to an excellent and satisfactory system,

after the Blocks are completed. The extra delays and costs will still have to be allowed for, of course.

3. There are enough faults and uncertainties uncovered in the evaluations that the Government cannot justify paying for yet another learning curve, and cannot trust the current procedures to produce what is needed. What we have to do then is more in the nature of getting what we can in the nature of a system good enough to experiment with, to plan with, and to use as a sort of laboratory facility. In that event, the initiation of parallel efforts, like a Pilot SAFE built around PMO, could be vastly aided by the experimentation that would be made possible.

It seems to me much the most likely that the third possibility will obtain. We might well hope for something better, but the Government ought not to count on it. The conclusions and recommendations below are based on the supposition that the third one is indeed valid.

5.2 Conclusions

1. The SAFE project is in very deep trouble indeed. The DCI needs to know what the status of SAFE is now, and what can reasonably be expected of it given any of the possible decisions that may be made.
2. The big obvious areas of concern, are:
The SAFE User Language
Many Aspects of System Design
Simulation, Benchmarking, Performance Analysis.

STAT

It is important that those areas be checked by impartial experts. For example, the failure of SUL represents fundamental problems in the underlying system design.

3. Other areas of concern are:
 - Data Base Management System
 - InterComputer Communication
 - Structured File Processing
 - CPU Capacities.

There is no reason to trust the proposed design as being suitable for the applications. These areas especially need inspection and evaluation by experts who work for neither CSPO

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4. The contractor has never really understood the problems of intelligence processing and analysis, as represented by the proposed solutions to the implementation of SAFE. It is extremely important that the contractor have that kind of understanding, and that the work reflect it.
5. Increment 2.5 is not acceptable as a deliverable. The least that can be accepted is the full Block 1.
6. The earliest reasonable date for the delivery of Block 1 is late in calendar 84; that presumes that much of the current underlying design turns out to be acceptable and sound. It should be expected that the extra time needed for the proper delivery of Block 1 will need proportionate funding.
7. If the current underlying design for SAFE needs drastic revision, then it must be accepted that much of the investment thus far in SAFE has been lost.
8. The design of SAFE must be undertaken with continuing contact between the engineers and the analysts, so that there is a real appreciation of the operational contexts in which SAFE must work.

5.3 Recommendations

STAP recommends that if the SAFE contract is to be continued, then:

1. The operation of Pilot Mail be continued and extended; the inclusion of some of the other functions of SAFE should be considered very strongly. This operation should be regarded as an integral part of the SAFE development process. Systems analysts and engineers responsible for design decisions should be responsible for being aware of experience with pilot SAFE.
2. An ad hoc panel be set up to evaluate the underlying design of SAFE as it currently is. It is important that this be done quickly, and that the panel provide an assessment by this spring. The panel should be composed of outside experts. STAP will be happy to lend assistance.
3. If the panel's assessment is favorable enough, the contractor be tasked to provide an integrated design for Block 1; this design should allow for further blocks and features perhaps even beyond those specified in the original requirements.
4. If the panel's assessment is favorable enough, a number of Government/contractor teams be established to review the existing set of user requirements to ensure that the contractor does indeed have a thorough understanding of each requirement--what it is, is meeting it, how the intelligence analysts would use it, and so on. Establishing these teams should be spelled out in the contract.
5. Both the contractor and CSPO be made responsible for providing a greater degree of technical expertise and leadership in the development of SAFE.

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Alternatively, the SAFE contract should be terminated.

GLOSSARY OF ACRONYMS

COINS Community Online Intelligence System

COTR Contract Office's Technical Representative

CPU Central Processing Unit (of a computer)

CSPO Consolidated SAFE Project Office

DBMS Data Base Management System

DDI Deputy Director for Intelligence -- used as shorthand
for Intelligence Directorate; used to be NFAC, National
Foreign Assessment Center

IC Intelligence Community, as in IC Staff

IOC Initial Operating Capability

OCR Office of Central Reference

ODP Office of Data Processing

PDR Preliminary Design Review

PMO Pilot Mail Operation

SAFE Support for the Analysts' File Environment

SAS Systems Analysis Staff

STAP Science & Technology Advisory Panel

SUL SAFE User Language

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UIWG User Interface Working Group (of CSPO)

ULS User Language Specification

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STAP OPTIONS FOR SAFE

1. Introduction

On 18 March 1980 we forwarded to you eight questions regarding the future evolution of the SAFE system and the relation of CIA SAFE to other community systems (See Appendix I). In this report we propose various actions which, if implemented, could yield a more valuable community asset in the long run. Because of the size of the system and its complexity, a delay (6 months to two years) in IOC can be anticipated. Productive use of this delay time can be made, as we discuss in subsequent sections.

In our examination of SAFE, we were impressed with the need for a community manager of the ADP-communication systems. None now exists and SAFE is not being integrated into an overall community architecture. As a result the incremental value of SAFE will be less than it could be. Even without a community manager, the future capabilities of SAFE could be strengthened and possible steps in that direction are described in Section 2. The longer term questions of technical direction of the overall Intelligence Community ADP-communication systems will be the subject of additional STAP analysis and should be considered a separate issue from that of SAFE.

The evolutionary development of SAFE will require analysis of how the community uses SAFE. Sections 3 and 4 describe means by which such analysis could proceed. As SAFE comes on line, it will be essential for future planning to evaluate its usefulness. A possible means for evaluation is described in Section 5.

Finally, we believe that a rich body of experience in systems similar to SAFE exists and could be beneficially applied to enhancing SAFE's capabilities. To this end, we

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propose in Section 6 establishment of an Advisory Council on Technology for SAFE.

This report primarily examines CIA SAFE and its use by the Intelligence Community. Our emphasis on CIA SAFE derives from the fact that NFAC stands to benefit greatly from a truly operational SAFE. DIA needs center on the accuracy, maintenance capability and general utility of their large encyclopedic files. These files require restructuring and improved maintenance capability as well as a high level of concurrency in use. Our analysis focuses on the analyst support function of SAFE; this function is of secondary importance to DIA. DIA's requirement can more easily be met than CIA's. Thus while we propose a "true pilot SAFE" for CIA, such an activity should not impede the development of the DIA SAFE. Indeed, the lessons learned in the "true pilot SAFE" will be of use in the evolutionary development of the DIA system.

In outlining the options for the future, we are fully aware of and appreciate the concerns of the SAFE management office and the Office of Central Reference. The steps outlined below will delay the scheduled delivery of an operational system, but we believe that the present schedule cannot be met since such critical items as command language and central hardware have not yet been decided upon. The delay we anticipate can be put to use to obtain operational experience on a "true pilot SAFE." The delays whether anticipated or not will cause problems with OMB and Congress and these should be recognized now.

2. Strengthening the SAFE Management

Strengthening of the community management of SAFE is essential if it is to become effective in satisfying its prescribed functions, and be capable of expanding flexibly and responsibly to aid the entire community.

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provide full-time support with undivided loyalties. They must, of course, have the rank and authority to deal with their contractor counterparts.

It is also likely that some outside expert advice would be helpful; and for 3) above, a standing Advisory Council on Technology (ACT) would seem most fitting. It is not clear whether the council should restrict its considerations to SAFE, or should in fact ultimately deal with a broader range of technological problems. These questions are amplified below in Section 6.

3. A True Pilot SAFE

Interim SAFE was initiated in 1974 as a set of capabilities on a 370/158 run by ODP. Four main capabilities were sought for the original SAFE project, and they are still valid today:

- 1) A mail/message/distribution system
- 2) Private files available on-line for analysts
- 3) Public files available on-line for analysts
- 4) On-line facilities for read, edit, write, and document production

These four have to be somewhat extended and modified in detail to match either today's purported goals or the real needs that underlie the requirements for the system. /

The chief uses made of interim SAFE were:

- 1) To provide limited experience for certain analysts in order to survey their expressed needs.

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2) To demonstrate the capabilities to management echelons, in order to help with the budget and funding processes.

3) To derive certain specifications that might serve as guides for the actual SAFE system specifications.

4) To illustrate the capabilities in the intelligence environment to possible proposed SAFE contractors.

It is important to observe that Interim SAFE was never used as a pilot system as that term is used in engineering--that is, to provide experience with a small system whose performance is operationally projected to be what the final system ought to be. In practice, of course, the pilot system serves in engineering to modify requirements and specifications in both usage and engineering.

In Interim SAFE, we were informed that in general statistics about usage were not gathered because they would be "not representative."

The questions that ought to be answered by a true pilot SAFE include:

- 1) What are the usage patterns of naive users?
- 2) What are the usage patterns of experienced users?
- 3) What needs for modifications of SAFE performance become manifest from the transition of naive users to experienced ones?
- 4) What are the user documentation and training requirements?
- 5) What new requirements emerge from the experienced usage?

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6) How should the services provided by SAFE be modified to take advantage of new technology?*

7) What facets of the system can be safely frozen in design concept? What parts must be carefully engineered to retain flexibility of function and performance?

Only a few of these questions can be dealt with through the current Interim SAFE. But there has been a great deal of experience elsewhere in systems similar in nature and size to SAFE; we note the unique aspects of much of the intelligence environment, which is why a true pilot SAFE is needed. But if advantage is taken of the continuing experience of these other systems, it is likely that the process of initiating a pilot SAFE and interacting with it to guide final SAFE development can be speeded up.

The questions above that seem at first glance to be uniquely answerable by pilot SAFE are 1, 2, 3, and 5. These have to do with analyst usage of the tools and capabilities provided to them. We are therefore suggesting that a first step is to start collecting systematic longitudinal data on analyst usage of the current Interim SAFE, continuing during a conversion to a true pilot SAFE.

There is little doubt that the general capabilities sought can be provided on a small scale by any of a large number of current installations outside the community, as well as inside. At least four members of STAP have had wide experience with such systems. Such systems also provide some of the extra capabilities that are not now planned as part of SAFE, but that are considered highly desirable, including:

1) collaborative capabilities, whereby several analysts can simultaneously and remotely collaborate on the same task.

*For example, good split-screen graphics terminals can take advantage of more powerful editing capabilities than previous terminals.

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2) general communications access to remote files over community or common carrier lines; this is relevant to making SAFE truly a community-wide resource, as is being strongly urged by certain members of the IC staff.

3) new evolutionary user languages, including the capability for user on-line control of multiple jobs simultaneously.

The actual implementation of pilot SAFE can therefore be handled in several ways:

1) Use the interim SAFE now running in ODP. Upgrade its capabilities, installing the above desired new capabilities, aiming at an integrated single system for continuing development.

2) Use an existing system from outside, but installed at the CIA, using outside contractor support as well as in house personnel.

3) Use an existing system at an outside contractor's installation, sending analysts on TDY to provide the usage, etc. The difficulties involved in this option are obvious, and it is included only for the sake of completeness.

The advantages of the first option are that interim SAFE is now running here, that both users and system personnel are familiar with it, and that it performs some of the needed capabilities already in the desired intelligence environment. The disadvantages are that some system reprogramming will be necessary to bring it to state of the art, and that this will likely need system architecture and programming resources beyond what is available here.

The advantage of the second option is that such a pilot system is nearly an off-the-shelf item, and could be running in the CIA fairly quickly. On the other hand, the special requirements of the community environment would enormously delay the user population as well as the systems and programming personnel at the CIA.

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In summary, we strongly suggest option 1, i.e., use the current interim SAFE. A conscientious effort toward the kind of pilot SAFE being discussed here entails:

1) Increased technological resources available in house. This should include some contractor [redacted] personnel, plus some [redacted] contractor personnel, to keep the former honest, as it were. A total of six people for the first eight months would be needed, and then perhaps dropping to four on a continuing basis.

2) Enlarging the user population and the user studies. This is so important, and has so many ramifications, that is the subject of a separate Section 4.

3) Establishing a direct COINS link that will enable study and experimentation by analysts in community-wide access and retrieval.

4) Initiating data gathering and analysis of usage pattern and changes in usage patterns by analyst users (see also Section 5)

5) Testing prepared user languages and other tools as soon as possible.

4. The Users of SAFE

There are two main reasons why the population of users of Pilot SAFE must be enlarged and modified from that of users of Interim SAFE:

- 1) We need to find out answers to what users do, how they do it, and how they change.
- 2) We need users to find out what SAFE can do for them, and how it can be responsive to their developing needs.

The first dictates the initiation of the continuing study of user patterns of usage that we have already mentioned. An IBM study of a somewhat different user community illustrates the approaches and the attacks that might be considered; it

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