s.i.t.a. monograph

Some head office activities

D. Kroneberg, editor

Société Internationale
de Télécommunications
Aéronautiques

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July, 1972

Preface

For several years SITA management has made a practice of inviting members of the General Assembly to an Information Session. The object of this meeting is to elaborate further on certain aspects in the Annual Report which may not have been described in detail and to answer questions from those who may only have the opportunity of meeting SITA general management representatives once a year. Such a meeting was held again this year in the afternoon of 9th May and we endeavoured to explain some of the tasks of SITA management.

Our 1971 Annual Report was distributed prior to this meeting and included an article on the SITA service written for the user of this service. In addition to this report the information meeting presented eight speakers from the SITA management and it was decided to publish their contributions in the number 2 edition of the newly-opened series of "SITA Monograph".

The following pages contain the texts of the eight presentations as transcribed from tape and only slight modifications have been made where considered necessary.

Neuilly,
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Introduction

G.A. Monniot, General Manager

The General Assembly is always rather formal, so this year we decided once again to take advantage of your having journeyed from the four corners of the world to talk a little more both about what we are doing now and what the future of your tool is likely to be; for SITA is your tool and this must never be forgotten.

I take this opportunity of thanking members of the Data Services Conference who accepted our invitation and all others present for their attendance at this afternoon session, which will enable them to see the way in which we are working.

I began by saying that SITA was your tool and, in fact, this is perhaps the most important point of a meeting such as to-day's, to realize that we are a community, that SITA is something which has been created by the airlines and that what we do will be according to your wishes and requirements.

You saw a presentation this morning of the connection through the SITA network of a BEA agent set to the BEACON reservations system in London. This seems to be very simple. You just push a button and the answer is on your screen in two or three seconds. It is, indeed, the definition of a good system that it should make the life of its user as easy as possible. It is only the systems designer, the expert, who needs to understand its inner workings. The underlying duty of SITA as we see it, therefore, is to provide you with a network which measures up to your requirements and which supplies the cheapest possible service.

For several years we have recognized that we have another task and that is that the information and knowledge which we have gained

over the years becomes your property. It is our duty to tell you what can be done to serve your companies more efficiently. This is the reason why we have decided to start a series of monographs, the first of which is being published today.

This first booklet, dealing with network control, is on the mathematical side. I hope that you will receive further booklets in this series in the future giving you more information on what lies behind the operation of a network, not only from the technological and financial aspects, but also from the human point of view: for example, how to deal with hundreds of people all over the world and how to make peace with them.

R. Bébié, Operations Manager

From 1948 to 1953 Civil Aviation Telecommunications, followed by one year with United Press.

SITA representative for Switzerland from 1954 to 1958 and from 1959 to date at SITA Head Office, Operations Department.

The Human Element in SITA Operations

What is the task of the SITA Operations Department and the operating staff in the SITA organization?

I shall not annoy you with discussions of our manifold technical operational problems: what we do if an airport terminal building burns out and we have to re-arrange local delivery in an emergency; or if a communications satellite fails linking all our circuits in North America to Latin America. I shall try to highlight a few of the human problems which have been brought about by the rapid development in telecommunications over the past years.

The operations people perform their job in an environment dominated mainly by : (a) the technology of equipment we use, (b) the service we want to provide to our customers and (c) the people to whom we provide service, and all this on a background of economy.

The economical aspect can be explained in a rather simple manner: airlines want as good as possible a service for as little money as possible.

With regard to technology and the service we provide, the last years' developments have a common denominator which I may qualify as: diversity and complexity.

Let's have a look at the diversity and complexity of the equipment we use. At the beginning of SITA operations, the teleprinter was the only technical equipment in use in our centres; later, in the late fifties, a limited number of electro-mechanical switching devices was used and since 1966 we have lived a rapid development with the introduction of modern electronic data processing equipment. Today, our personnel operates UNIVAC 418 II, 418 III, Philips DS 714,

satellite processors, Raytheon 706, Thomson 4020 and so on, and there is no reason to believe that this list is restrictive and will not continue to expand in the future.

In order to take full advantage of the capabilities of this modern gear, it is very important that operations people have a high degree of technical knowledge, and, therefore, today and for the coming years, one of our main concerns is education and training.

With regard to the service provided to the airlines, we can see the same development. In the very beginning, only conventional teletype messages were dealt with, type B traffic, and we only considered one degree of urgency; some time later we introduced a priority scheme, where messages were handled according to different degrees of urgency. In 1971 a major event started with the handling of traffic exchanged between reservation systems and associated agent sets. All this has introduced new requirements of quality.

Looking at the diversity of people, I should like to make two points:

First: Diversity of the people to whom we provide service is not new for SITA; ever since we spread our network all over the world we have been dealing with people of different nationalities, different religions.

Second: The diversity of people contributing to the quality of service. Looking back in the past, at first there was very simple technical equipment used in the centres and all message-switching functions were performed by operations people. The quality of service depended entirely on their performance. Today it is no longer so. With the modern equipment in use, there are new categories of people who must contribute to its operation: Programmers and Engineers. Today we can only achieve the quality of service to the airlines if there is perfect co-operation between these people: Engineers, Programmers and Operators.

C. Avignon, Deputy Manager Programming

Spent three years in the French Air Force first as an Air Traffic Controller and then as a flying test technician.

Flying prototypes and testing new equipment (radar, navigation, fully automatic landing systems). This activity was followed by four years with Air France (programming department) and one year with National Cash Register. Gained some experience in real-time applications for banking. Completed training as an Analyst and Project Manager. Joined SITA in 1968.

Some Software Aspects

Software is a very wide subject which cannot be covered in a short time. I shall, therefore, explain the way in which we have built the programming department, then develop some ideas about the difficulties, and how their bad effects can be minimized by the stability and training of the personnel.

When the automation of the network began, the SITA management felt that it was of the greatest importance for the future to have its own programming group. For that reason SITA programmers have participated in the original development of the software, under the guidance of experts from the manufacturers. These programmers are still working with us and they constitute what I would call the nucleus of our different programming groups. From time to time, by hiring new programmers having another kind of new experience, we have injected new blood into these groups. The experience accumulated in this way is such that we can now face all kinds of problems or new requirements without any outside help.

The SITA software is the essence of a real-time system and as such it suffers from the newness of this technique.

There is no universal method for implementing a real-time system; some broad guide lines only exist. Each time a new system is to be implemented it is necessary, therefore, to invent new methods. After implementation the behaviour of the system still has to be observed and eventually some of its parameters have to be readjusted. This is the only way to improve efficiency in the present state of the technique. It is a long process which can only be achieved if the programmers who have participated in the development are still working on the same project. SITA programmers are, we hope, exceptionally stable.

The implementation of the High Level Network is an illustration of this observation. Although the program itself had been made by the

manufacturers, the implementation of the network has been done by SITA. During the different phases, intensive testing was carried out and a number of deficiencies or weaknesses, either in the program or in the procedure were discovered and corrected. The High Level Network is now giving satisfaction, but observation continues and from time to time some improvements are made.

Another example of the advantage one can obtain from stable manpower is the extension of our FRA center. This center presently equipped with two UNIVAC 418 II is reaching its maximum capability. The programmers, being well acquainted with the system, have suggested the addition of a third 418 II. This solution, economical in terms of money and time required for the implementation, will be realised entirely by SITA.

Another major difficulty inherent in real-time is that the programs are working in an ever-changing environment. Under these conditions, the cleaning of the programs is much more difficult than in, say, a pay-roll application. As an example of these changes I would mention the recent installation of the satellite processors. These small computers are linked to the main centers by a medium-speed circuit. All information exchanged between the satellite processor and its main center is controlled by procedure. The programs contained in the satellite processor have been developed by the manufacturers. Here again some SITA programmers have participated in this effort and are now gradually taking over the full responsibility for the maintenance and further development of these systems.

At the other end of the circuit, the SITA programmers have developed the interface in the main center entirely.

This has not been an easy task, as is the case each time a major change has to be integrated into a system already existing. There

is no doubt that it has been conducted successfully because of the continuity which exists inside the SITA programming groups.

Apart from the stability of the programmers, the training of new programmers is another means of overcoming certain difficulties of a real-time system. The normal way to train programmers is to give them a three or four weeks' course on the computer they will have to program. This solution is applicable when a completely new system is to be implemented. In SITA we have used another approach as the systems already exist. New programmers are still trained on the computer, but in addition they receive a course which details the system. Obviously the training period is longer, but the final result is certainly much better, and the programmers can very soon manage on their own.

A certain amount of time during the training period is also devoted to the operational aspects so that the programmers, knowing the importance of a message, have more respect for it. The quality of their work is certainly higher than it would be if they did not know what was going on outside their computers.

To conclude, I should again like to stress that continuity in manpower, wide experience and a well-adapted training are some of the conditions which have contributed to limiting the adverse effects of the major difficulties which are encountered when implementing a real-time system.

B. Weibel, Assistant to Operations Manager

On termination of technical studies in the field of radio engineering, joined the French Merchant Navy as Radio-Navigation officer. After 2½ years on ships, changed to Civil Aviation as Air Traffic Controller with the French Civil Aviation before joining SITA in 1961. Was stationed as SITA representative in Africa and Scandinavia for several years and was appointed to Head Office in 1968.

Network Development Projects

You all know what the SITA network is. You all know how extended it is and what high performances it is capable of. But there is perhaps one aspect, and probably the most important, which is not always clearly realized and that is: the SITA network as it is today, with its worldwide coverage and its high standard of performances, is nothing but the consolidated result of a series of decisions that have been taken by yourselves, or to be more precise, it represents the realization of our continuous general development plan composed of a great number of projects that in the course of the years were submitted to your approval, which indeed they were given.

Presented like that in a nutshell, it sounds very simple but in reality, hundreds or, more probably, thousands of man-months have been necessary just to elaborate the projects and considering the results that have been achieved, we felt that it would certainly interest you to know a little bit more on how we, in SITA, tackle those projects and this will be the subject of this short presentation.

Behind each single project, and, very often a long time before it can even be called a project, there is always a need, a necessity.

How do we know that there is or that there will be a need? Well, here various approaches are possible. Sometimes one airline, or several airlines simultaneously, bring to our knowledge that for a given city or a specific area of their network, there is a lack of reliable communications or no communications at all. At other times, groups of airlines, at the occasion of regional meetings, such as those of the Permanent Telecommunications Working Group for South America and the Caribbean area or the Asian and Pacific Area Airlines Group, establish recommendations to SITA for the implementation of new facilities or the improvement and modernization of existing parts of the SITA network. Very often also, we

in SITA, through constant monitoring of the volume and quality of traffic passing through the network, combined with regular exchanges of views with our member airlines in terms of development of their own activities, their future requirements for conventional as well as conversational type of communications, we are able to establish certain forecasts which, after careful processing, can be translated into foreseeable needs. Of course, there are many other ways by which the needs can be recognized and identified but those that I have just mentioned are the approaches which are the most frequently utilized.

There are, of course, needs which are very specific to one single airline such as a more extensive participation in a given part of the SITA network, for example, or the connection of reservation agent sets in cities where the adequate SITA facilities are readily available, but in general such needs can be satisfied without entailing major modifications of existing facilities and, therefore, I shall keep such projects out of my presentation.

As I have mentioned earlier, the starting point of each project is the recognition and identification of the needs, but once this has been done, we are not quite through with it. Howsoever those needs may have been expressed by one airline, group of airlines or identified through our own research work, our rule is always to try to determine, in a true spirit of community and of cooperation, whether the needs expressed could not end up in a project which would be of interest to the entire community of our member airlines or at least to a large majority of it.

I am quite sure that most of you have received at one time or another, a message or a short letter informing them that SITA is intending to implement facilities here or there and that with a view to establishing a detailed project, information be given of general interest, traffic volumes and routing, costs, etc. The object of such requests is simply to make sure that none of our members who might have an interest in one of our projects be left out of it. At the same time, the information that we can thus collect is of major importance to us when we reach the stage where we must

determine the quantity and quality of facilities to be included in the project concerned.

But before reaching that stage, a tremendous amount of work is still to be performed and I will certainly not go into the detail of each step.

I should simply like to mention in a few words the main actions that are generally undertaken before a detailed project document is issued.

Once the needs have been assessed in as precise a manner as possible, the Operations Department elaborates detailed operational specifications which are the result of complex studies involving traffic analyses in terms of volumes and flows, network configuration, availability and costs of circuits, definition of the traffic routing, staff requirements and accommodation, supply of telegraphic and/or other communication equipment for the smaller projects and many other aspects related to the operation of a given project.

Very often, all the necessary elements cannot be assessed from the Head Office and, in such cases, it is necessary to go on the spot to make a comprehensive survey of the local situation, which is sometimes done by a delegate of the Operations Department or, more generally, by SITA's General Management delegates stationed abroad.

The thus consolidated operation specifications are then transferred to our Financial Department who has the rather delicate task of figuring out the investments and the operating costs of each single project.

However, depending on the importance of the project concerned, other departments in the SITA Head Office may also be called for contribution at this stage. This is particularly the case when the project relates to the implementation of an automatic switching system. On the basis of the operational specifications, our Systems Planning

and Programming Departments are then to work on systems design, hardware and software requirements, choice of the most suitable type of equipment etc. They will also hold preliminary discussions with manufacturers on equipment capabilities, availability, delivery delays, maintenance problems, prices and many other highly technical aspects. There is no need to say that this part of a computer project is not the easiest one.

Based upon their findings which we may call "systems specifications", another of our groups, specialized in the definition of computer sites, will then establish not only the necessary site requirements to house the system but also define the ancillary equipment, such as the telegraph interface, main and emergency power supplies, the airconditioning and so forth, which you will appreciate, is also a very delicate and complex task. All these elements, together with their individual price quotation, are then transferred to our Financial Department whose job, as I have already said earlier, is then to answer the most important question "WHAT DOES IT COST ?"

(I humbly apologize here to our Finance Manager for my summing-up his very important contribution to our projects in just four little words which certainly do not reflect the number of grey hairs he gets by trying to reduce the project costs for the benefit of our member airlines.)

Well, this "what does it cost?" question being answered after very thorough cost analyses, the job can practically be considered as terminated. At this stage, it is not yet a real project but rather a feasibility study report which is submitted to the final approval of our General Manager who has also monitored all the various earlier phases of the project and issued the necessary instructions to all departments concerned if alterations had to be brought to certain specific aspects of the study.

The SITA internal green light being given, the feasibility study report is then generally handed back to the Operations Department who is in charge of drafting the project letter or project document as such, which will be mailed to all member airlines

concerned for approval and comments.

In general, the comments start coming back about one or two weeks after despatch of the project document. Approval comes only much later, depending upon the importance of the project concerned. Evidently, the more money involved, the closer the figures we have produced are being looked at, the interests of an individual airline sometimes taking precedence over the interests of the community.

It has even happened that certain projects were temporarily or definitively abandoned, the majority of the airlines concerned not having shared our views.

But, ladies and gentlemen, such refusals should not be considered as negative. On the contrary, it proves once more that the SITA network <u>is</u> as you have decided <u>it ought to be</u> and looking at it today, at its size, its performance and its capabilities, then I think that, not only have our projects been fairly successful so far, but also that your decision to approve them has been the right decision.

Allan Karson, Technical Adviser

Has been in the information systems field for over twenty years, specializing in the design and development of computer/communication systems used in both Europe and the United States. Prior to becoming a technical adviser on the SITA staff, where he is responsible for the implementation of the Type A service, he was with such international organisations as ITT, Auerbach Corporation, and Data Systems Analysts.

Type "A" Service

Starting in the autumn of 1971, SITA has made available to its member airlines a new message service called the Type A service. This service enables an airline to connect its agent sets, located in its many reservation offices throughout the world, to its automated reservation processing system. Since many of you have participated in the conceptual planning for the service, we have considered it worthwhile to give a management overview of what this service is, what it means to the airlines, and how it is being used today and in the future.

To do this, I propose to discuss three key aspects of the Type A service.

First, we shall review the High Level Network, which is the backbone of the Type A service.

Secondly, we shall examine how SITA is providing this service to its first Type A user, which is BEA.

Thirdly, we shall talk of the planned growth of this service and at the same time will give you an idea of the challenging problems involved in providing such a service.

First, let us review the main features of the high level network, which many of you are already well acquainted with.

The SITA High Level Network consists of two major components : message switching centers and medium-speed data circuits.

The message switching centers are located in eight of the major cities of the world : Amsterdam, Brussels, Frankfurt, London, Madrid, New York, Paris and Rome. Centers are interconnected by data circuits which operate at 2400 bits per second. They will soon be upgraded to operate at 4800 bits per second.

Each High Level Center contains a large message switching computer consisting of a central processor, magnetic drums and tapes and communication equipment. In each processor are large, specially-designed computer programs, constantly being improved upon and expanded by the SITA programming staff.

Now for a brief discussion of what the High Level Network does. Basically, it allows a message entered at one center to be sent to one or more terminals attached to any of the centers, in a rapid, reliable and economic way.

A message can enter or leave the High Level Network at any of the High Level Centers. The way that messages enter or leave a center is via terminals, which can be teleprinters, agent sets or computers. Each center can have connected to it a mix of these terminals; the quantity of terminal that can be connected to a center is in the order of "hundreds of terminals". A message can enter or leave a center at a low speed, say 10 characters per second, or at a high speed, such as 300 characters per second. The input/output speeds are determined by the speed of the device which is attached to the High Level Center, or by the speed of the line connecting the device. Thus, for example, if we attach a teletype, the input/output speed may be 10 characters per second; if we attach a

computer or agent set, it is 300 characters per second. Messages are transported within the network itself at a rate of 300 characters per second.

The SITA message switching centers perform their operation using a technique called "Store and Forward". In this technique, messages entering a center are temporarily stored in an entry center. After the message is completely and accurately received at that first center, the entry center forwards the message to the next center in the chain. The following center, too, waits until it receives the message completely and accurately before forwarding the message to the next center. Thus each successive center performs the same "Store and Forward" procedure. One of the key advantages of the use of the Store and Forward technique is that it enables you to maximise the utilisation of communication circuits.

We have just reviewed what the High Level Network is. Now let us see how SITA's HLN handles Type A reservation traffic. How does a message go from an agent set to BEACON and back to the agent set via the SITA HLN? BEACON is the BEA's acronym for its processing system which handles reservations, passenger-boarding control, and flight information. First, a message is typed in by a reservation agent at a UNISCOPE. After the message is completely and accurately composed by the agent, he presses a TRANSMIT button. The message is either asking for information from BEACON, for example, status of flights, or is requesting a return confirmation message indicating that the input message has inserted valid information in BEACON. In any case, the reservation agent is waiting for a response from BEACON. As we shall see, for an average message, the agent need not wait more than 3 or 4 seconds for this response from BEACON to be displayed on the UNISCOPE.

To see what transpires from the time he depresses the TRANSMIT button to when he receives his response of the display, we can examine the round trip path. An average reservation message will require approximately a sixth of a second to travel from one unit to the next. This time is based on the connection circuits speed which we said is 2 400 bits per second, which is equal to 300 characters per second. Since an average message is about 50 characters long, we therefore send a message between major units on the HLC in 1/6 of a second. From Rome, for example, we go on four links in each direction, accounting for a total of eight links, or about 1.3 seconds.

There are also short delays for processing and queueing messages in each center. Thus we should add approximately 1.5 seconds for HLC processing (to traverse the Rome, Frankfurt, London centers) and for processing time at BEACON. But we must not forget that agent sets will be connected to a High Level Center through a satellite processor which accounts for about another third of a second in the round-trip bringing us to the approximate lower limit of slightly more than three seconds. This is quite a rapid operation for such a path of many computers. And with it comes economy and reliability through redundancy and special message-handling procedures.

That covers the particular handling of one airline's Type A traffic. I should now like to explain the full potential of the netowrk.

Now, what would happen if the Type A traffic procedures of the HLN are used by more than one airline? Let us assume that the IBERIA reservation system located in Madrid required connection of remote terminals through this network.

Then the Iberia terminals will be connected to SPs in various locations in Europe, and the SITA HLN will transport both BEA and Iberia Type A traffic simultaneously. Similarly as reservation systems of other airlines and their respective agent sets are connected, this configuration will grow in complexity and in scope.

Thus, the basic communication system that was described which is working today with BEA can work with any of your airlines systems. This is true even though most of the world's airlines use different data message formats and data processing procedures, in addition to the fact that they each may use a different central reservation computer and agent set type within their respective systems.

I should like to return to the discussion concerning message flow: a message goes through BEA UNISCOPES; then devices called agent set control units; then through special communications processors called "Satellite Processors". They are used to concentrate message flow within a city or a country; through SITA's large High Level Centers which are interconnected on a succession of international circuits; to BEA's BEACON system which performs message verification and information retrieval; and thence retransmission in the reverse path. Thus we see here four different staging areas which must be individually treated by the Airline/SITA technical staffs (if we treat the agent set and their control units as one stage.)

Add to this complexity the many agent sets and computers of many airlines to each High Level Center. That is but one of the problems of complexity brought about from scope of service that the system must provide.

A quick look on the future expansion of the SITA type A service is interesting. By the end of 1972 it will be providing service in 8 countries, 20 cities and to over 200 agent sets.

We look forward to extending this to more than 600 agent sets, for about 5 airlines by 1973.

We can now summarize what has been presented today.

In the area of technology the SITA type A service is made possible by the integration of a wide variety of subsystems, using highly advanced computer and communication technology.

In the area of universality the type A messages are sent on the SITA network in a system which is capable of accepting messages from any of the world's airlines.

Finally, in the area of service the SITA type A service provides an economical service to its member airline companies, which is comparable with a dedicated service in terms of response time and message security.

C. Deroual, Financial Manager

Normal classical studies up to and including Baccalaureat (math). Three years at E.S.C.P., a Paris business school.

After military service, joined Air France Head Office (Financial Department).

Was posted 1½ years later to Karachi as Administrative Manager of the Regional Representation for Pakistan and Afghanistan. (In charge of financial and fiscal matters, cost control, personnel management and property management.)

Returned to Head Office in 1959 and appointed to Financial inspection.

Joined SITA in 1961 as Deputy Financial Manager. Took over as Financial Manager in 1967.

Some Financial Considerations

To follow on my colleagues' reports on what is happening in SITA, I should like to speak on a rather delicate matter which was solved only recently (in fact, a few hours ago at the Board of Directors meeting) and which is the problem of an adequate charging scheme for data (type A) traffic.

The appearance of type A traffic on the SITA network is an important event in the life of the company. So far, we have been handling one category of traffic. Admittedly, various precedence levels were brought in to provide the airlines with the quality of service they required, but we have now introduced something which, as Mr. Karson explained, is different: a new type of service. This raised a number of problems for both type A users and for those members who, for the time being, are interested in type B (or conventional telegraph traffic) only. The main difficulty resided in the devising of an attractive and equitable cost sharing scheme for type A whilst, at the same time, ensuring that there would be no adverse consequences for users with type B traffic only.

This problem could only be solved by, on the one hand, bearing in mind SITA's cooperative principles, and on the other, looking at facts and figures.

One of the most important points is the fact that the SITA automatic network (which includes not only the High Level Network but also some automatic elements considered as being part of the low level network, such as satellite processors) was implemented in 1966, with a computer system in Frankfurt, and has since then been gradually developed and that, up till 1972, it handled no type A traffic.

During the past five years, the capacity of the network has been expanded to meet the requirements of B traffic; it can safely be said that, in its

present configuration, the network is no more than adequate for the type B traffic it has to handle at the present time. During the same period, the unit costs decreased gradually. I would explain here that, by unit cost, I mean the overall cost of SITA's activities divided by the traffic offered to and received from SITA by member airlines which, in SITA's jargon, is known as the "potential" traffic (a traffic count in no way influenced by the number of transit points). In 1967, this cost per unit stood at 13.4 cents; if this 1967 figure is taken as index 100, we see that this cost decreased to 13.0 cents in 1969 (97% of the 1967 cost) and had by 1971 dropped to 12.17 cents, or 90 as compared to the 100 of 1967; this with B traffic only.

The above costs are expressed in current US cents. As you know, this currency has been affected by devaluation. Incidentally, I should like to warn you that the costs you find on your statements, expressed in dollars, may appear to be slightly higher (especially during the slack period at the beginning of the year) than they were in 1971. If, however, we take the constant value of the US dollar, by applying some of the indexes produced, for example, by the First National City Bank, we see that from the 13.41 cents constituting the index of 100 for 1967, today's unit cost in constant dollar value is down to 10 cents, or index 80 compared to the 100 of 1967.

The point I wish to make, therefore, is that with type B traffic alone, the cost has been decreasing constantly in spite of inflationary pressure and that the present day cost level is acceptable for type B users.

The second fact we have to mention (and this, being a technical factor, will be enlarged on by Mr. Andorka) is that type A traffic requires less effort from a computer than type B and that, with the present capacity of the network, we shall therefore be able to connect quite a considerable number of agent sets, running into several hundreds, and to handle type A traffic without additional operating costs, with the exception of small

amounts already planned for the up-grading of some of the high level network circuits.

With these two facts in mind, the SITA Board of Directors and the Management attempted to evolve a scheme which would attract type A traffic to the network; in the present situation, it is evident that the interests of all concerned depend on SITA being in a position to offer a satisfactory cost for an efficient handling of type A traffic which will in turn reduce costs of type B users.

The adapted cost sharing scheme was studied at length by the Financial Standing Committee and referred on various occasions to the Board for guidance; after various trials, we arrived at the final formula which was approved this morning by the Board of Directors and which I now intend to comment on briefly.

Details will of course be distributed to all users of the SITA network and you will then have the opportunity of examining it more fully, but I should like now to mention the main points of this scheme.

Reference will be made to "agent sets", by which we mean a device capable of exchanging information with an airline computer; for the time being, this will be a reservation system although in future other computer applications may be involved. The tariff will comprise two charges: a fixed quarterly charge and a charge varying with traffic volumes:

- the fixed quarterly charge per set (as you know, the periodicity for invoicing is quarterly) will vary in proportion to the number of agent sets connected to any one line which is itself connected to a SITA processor. The intention here is evident: SITA wants airlines to concentrate as many sets as is technically possible on one line to utilise fully the connection possibilities offered by the SITA systems (e.g. satellite processors), and thereby avoid increasing their size unduly. This fixed charge will entitle the

airline to 2.5 million characters sent or received by each agent set per quarter. It will decrease in proportion to the number of sets, the first four being charged at the rate of $500 each per quarter, the next four at $300 each per quarter, from the ninth to the twelfth at $250 each per quarter, from the thirteenth to the sixteenth at $200 each per quarter and from the seventeenth onwards at $125 each per quarter. To make matters quite clear, an example can be taken of an airline with six agent sets: the first four would be charged $500 each; the fifth and the sixth $300 each per quarter, provided all six are connected to the same line. (All in U.S.$)

- the variable charge in relation to traffic volumes: the possibility of a single fixed charge per set was at one time envisaged but, in order to provide an incentive to airlines to streamline their procedures and in an effort to restrict the volume of traffic which could otherwise saturate some of SITA's installations in the future (we all expect a considerable development of this type A service on the network), the Board of Directors decided to create a charge equivalent to 1 cent for every 100 characters over and above the 2.5 million per set per quarter covered by the fixed charge.

Broadly speaking, then, this is the scheme. In addition to these charges which are specific to type A operation, the airlines will of course continue paying the fee for medium speed line connection to SITA systems as they do today.

This type A tariff will be applied unchanged until the end of 1973, when the Board of Directors will review the situation; in the meantime, we shall study its application and gather as much information as we can in view of a possible and slight revision of its terms. We can all expect that, with the development of activities within SITA itself and in the air transport industry, any revision should not lead to an increase but rather to lower rates.

As you will have noticed, this scheme is simple to apply and easily used in advance cost evaluations. It will therefore facilitate the appraisal of a project's economic feasibility and airlines' comparisons with their own private solutions.

We shall of course be happy to answer any query from prospective type A customers and to conduct joint studies with them on connection of their sets to SITA's network.

It is the intention of the Board and the SITA Management to devise a modified scheme for type B traffic along similar lines. This will no doubt take a number of months and airlines represented on the Financial Standing Committee and the Board will be closely associated in the elaboration of this new scheme, which should enable us to offer a more simple formula for type B traffic also, with certain differences, of course, the problem in respect of type B usage being somewhat more complex.

In essence, then, this is what I wanted to mention today. I would insist once again on the fact that type B traffic will not be subsidising type A. The network in its present state and form is fully necessary for the handling of conventional traffic; it does, however, place SITA in the pleasant position of being able to handle data traffic at no additional cost. If I insist on this point, it is because certain rumours prove that some airlines are perhaps not convinced that this is the case and feel they have reason to doubt that type B users will not suffer from this development of the SITA network. This is not so. Introduction of data traffic handling is in the interest of all SITA members and I am convinced that, within a very short time, it will be looked on with satisfaction.

Finally, I should just like to mention that in order to maintain the quality of service from which our members now benefit, we must, of course, invest considerable sums of money. You have no doubt seen this in the investment plan. The 1972 and 1973 figures are, we hope, as accurate as possible and give an indication of the various cities where we plan to invest so that automation of the network can be spread to other parts of the world; the forecasts for 1974 to 1976, however, must

be considered simply as guidelines. Investment will be substantial: in fact, during the first few years, it represents roughly 20% of our annual turnover. We are, naturally, handling this question with the utmost care and, as in the past, shall endeavour to finance as many of our investments as possible through suppliers' credit, when such terms can be obtained reasonably, and through bank loans.

One point should be mentioned in this connection. After lengthy discussions which started last year, our bankers asked us to secure a guarantee from our members; in the past, the Head Office premises in Paris themselves constituted the necessary guarantee but it is obvious that this could not continue indefinitely. The matter was discussed by the Financial Standing Committee; representatives on this committee all being drawn from the larger users, they came to the conclusion that since, from an administrative point of view, it would be extremely difficult to obtain letters of guarantee each year from all of SITA's 160 members, the 20 largest users should be asked to stand as guarantors vis-à-vis the bank on behalf of the entire community, to facilitate the matter of obtaining bank loans. In the name of the SITA management I wish to express my thanks to the major users for this decision.

As the administrative formalities have now been completed, we shall dispose of the first of these guarantees from our twenty largest users in a few weeks' time; this should enable us to finance our development with greater ease for the entire SITA community.

This should not constitute a reason for showing less interest than in the past in the development of the company: there will always remain a part of our investments which has to be financed by you, the airlines, in your capacity as shareholders in the company. As has been repeated several times, SITA is in fact something which has been created by the airlines: it is, therefore, your money and your development of which I have been speaking and which we are looking after to the best of our ability.

D. Andorka, Manager, Systems Planning

Standard Telephone & Cable Ltd., London, from 1960 to 1965, first as logic designer and systems engineer on the first fully automatic message-switching system "STRAD, then system designer and project engineer for special applications based on the STC Stantec Zebra computer.

Worked finally on the ADX 8300 message-switching system with responsibility for development of the magnetic tape and communications sub-systems.

Joined SITA in 1965.

Technical Considerations on the Automatic Network

I should like to say a few words about the capabilities and technical characteristics of the High Level Network which serves as a tool to fulfil the various requirements put forward to SITA by its member airlines. Being in charge of the Systems Planning Department of SITA I have tried for several years to explain to our potential customers these capabilities, and today I have another opportunity - although a very small one - to elaborate further on this subject.

In the early 1960s SITA started developing specifications for the HLN and by 1965 we were able to foresee the transmission of two categories of traffic which we called "conventional messages" (class B traffic) and data messages for automatic reservation systems (class A traffic). The main idea was that these two types of traffic should be handled over the same network for reasons of economy and, therefore, through the same switching computers. Even in these early days - although we did not have as many details about forthcoming requirements as we may have now - we considered the handling of other types of traffic, such as meteorological data etc., by the same network, which we put into class C.

As was mentioned before in this meeting, towards the end of 1971 we finally succeeded in handling successfully messages of the class A type in parallel with telegrams of the class B type which proves that the SITA High Level Network is performing the task for which it was designed.

The requirements of the two classes of traffic under consideration are quite different. Conventional messages do not require immediate response. They are offered to this store-and-forward network of ours on the understanding that SITA takes the responsibility for their proper transmission to the final destination,

which means that this type of traffic requires a complete protection with regard to its transmission security. By definition, this includes retrieval functions as well. The handling of this type of traffic, therefore, takes up a large percentage of the computer power available, although the rapidity of transmission is of no concern. As a matter of fact, the handling of class B traffic compared with the handling of class A traffic presents a requirement for almost five times more computer capacity - a factor which is often misunderstood by many people.

The main characteristic of class A traffic is its requirement for a very short response time. This is related as well to the length of the messages. Conventional messages consist of some 200 characters on average, whilst the traffic originated by agent sets and destined to reservations processors consists of some 50-70 characters. In addition, class A messages are transmitted under human control, that is a reservations clerk issuing a message waits until he receives a response. This is a major point which permits us to omit any retrieval functions for this class of traffic in our switching computers.

Class A messages are, therefore, kept in core memory in all the centers they have to pass through and this method enables us to guarantee a very short transition time even if such a message has to go through three High Level centers.

The general transmission scheme used by SITA enables us to give utmost priority to all class A messages and we are often asked whether this would influence the quality of service we can offer for the transmission of class B messages. I should like to state here that with the transmission speed used today, which is 2 400 bps, the queueing delay imposed on class B telegrams (because of the priority handling of class A messages) is almost negligible and this will further improve as soon as we change our transmission speed to 4 800 bps. This change is foreseen for the end of this year. We have calculated that even the connection of more than 1500 agent sets

to the High Level Network would not cause any great impact on the transmission quality of class B telegrams.

Now let us say a few words about our satellite processors. I admit that the term we developed for these small computers may be misleading in the light of telecommunications satellites, but what we meant when creating this term was to indicate that these switching computers were not standing alone, but were remotely controlled by the High Level switching centres. Satellite processors are small but rather fast programmed computers without peripherals such as drums or tape storage. These machines are being installed at locations where airline companies would like to connect their reservation agent sets and also where there is a concentration of TTY circuits. At the present there are three different types of agent sets used by the major member airlines and they are Raytheon, UNIVAC or IBM manufactured. The satellite processors chosen by SITA are Raytheon, Thomson Houston. The actual configuration of our satellite processors permits the connection of 64 teleprinter circuits and includes the programmes for the handling of three different types of agent set. With regard to the throughput capacity, these machines are capable of handling more than 150 agent sets. Studies are in progress for increasing the capacity of these machines to handle more than 200 agent sets and 64 teleprinter circuits.

Generally speaking, we can say that the High Level Network as it was designed and implemented by SITA is doing its job and has just started to show that it really can perform its tasks. Bearing in mind that this network consists of a rather complex variety of components - i.e. computers of various makes and conceptions, modems, circuits etc. - and handles two classes of traffic with differing service requirements is indeed a success of which we can be proud. On the other hand, we know that this network has enormous capacities which require permanent efforts on our side for further development and improvement. I can assure you that the technical manpower we have in SITA will guarantee that not only your present-day, but also your future requirements, will be handled to your satisfaction.

D. Kroneberg, Manager, Long Term Planning

Degree from University of Halle in Theoretical Physics in 1950. Several years with Siemens Central Laboratory developing long-distance dialling systems, telegraph switching systems and computers. Joined SITA in 1959.

Managing Editor of the German computer journal "Elektronische Rechenanlagen".

Publications Officer of International Federation for Information Processing.

Long Term Plans in SITA

Not only in SITA, but in any other business of today, experts are wondering where the boundaries between short term and long term planning should be defined. Basically, the difference between the two approaches for planning for the future seem to have only one significant characteristic, and that is the investment of money. But if we look at the matter more closely we find that different types of approaches are required in many cases, and that means different types of people to perform these tasks.

It is well understood that these boundaries between short term and long term planning fluctuate, not only from business to business, but also within the framework of one and the same enterprise from project to project. If, today, our knowledge of the present is almost 100%, this figure declines as time goes by and we reach the point at some time in the future where our knowledge will change from certainty into probability, guesswork and total uncertainty.

In a community such as SITA we have to add to this general rule the facts that :

(1) the requirements for telecommunications vary from one member of the community to the other at any given point of time, and

(2) the community itself does not present a stationary entity and any individual deviations from the common interest have to be taken into consideration.

The investment planning, as well as the future service which SITA would like to provide for its users, requires, nevertheless, efforts for long term planning which should cover an interval of five to ten years. It is understood that such an approach can only be undertaken in a common

effort, in other words: the SITA community must not be considered only as a sharing of facilities, but requires - more than ever before - a sharing of plans.

Now what are the aims of SITA in the more or less remote future? Let us first repeat the three main parameters of SITA (excepting economy, of course) which are: (1) rapidity of service, (2) security of transmission and (3) geographical distribution of the network.

Bearing in mind all probable forthcoming requirements for the transmission of airlines' digital data over a shared network we can assume that these three parameters will remain unchanged, although there may be changes in their statistical weight for given types of traffic. Based on this fundamental assumption, we could work out - and I give here a purely personal opinion - the main problems for which SITA will have to find solutions in the not too distant future.

These are:

(1) Analysing the reliability of the network as a whole by considering this network as a "large scale system" which should never come to a standstill as a whole, but which for reasons of economy may admittedly see breakdowns in certain of its components: be it centres or circuits or other units. Such an analysis must finally lead to a philosophy on the future planning for stand-by computers, stand-by power supplies in the various centres, alternate routing paths etc.

(2) The development of an improved system of network control which at any given point in time would not only collect the necessary data concerning the status of the components of this network, but would also indicate - and this by computer support to the highest possible extent - the necessary action to be taken by the fewer and fewer human beings behind the scenes.

A third point may be an analysis of the "concentration degree" of a future network. Discussions up till now have not been conclusive as to whether a higher degree (that means fewer computers) than today or a lower degree (that means more smaller units) would be the safer and, at the same time, the more economic solution.

Compared with these three main aspects the planning for personnel (including recruitment, re-education etc.) the follow-up of forthcoming new types of traffic, as often quoted, and the follow-up of technical development in the field of both telecommunications and computers must not be overlooked.

It is, of course, impossible further to outline in a few minutes the consequences for the SITA community (which may have to be done at a later stage by a more scientific approach.) Today the only aim was to outline some of the main arguments and to show that although the future may seem somewhat dark to all of us, we can still try to get a grip on it. I should like to conclude by quoting what was written in the SITA Annual Report of 1971:
"SITA will not be able to meet each and every individual requirement of a given member in a given area, but SITA's main goal should remain what it has always been: to make every possible effort to meet as many as possible of the various requirements put forward by member airlines with the utmost economy."

SOCIETE INTERNATIONALE
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Registered Office:
36, rue du Cardinal-Mercier
Brussels - Belgium

Administrative Head Office:
112, avenue Charles-de-Gaulle
92-Neuilly-sur-Seine - France

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