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Briefing Report to the Chairman, Subcommittee on Telecommunications and Finance, Committee on Energy and Commerce, House of Representatives

February 1989

ELECTRONIC FUNDS TRANSFER

Information on Three Critical Banking Systems

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Technology Division

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The Honorable Edward J. Markey
Chairman, Subcommittee on Telecommunications
and Finance
Committee on Energy and Commerce
House of Representatives

Dear Mr. Chairman:

This report documents a December 7, 1988, oral briefing provided to your office. That briefing and this report respond to a November 21, 1988, request that we provide available background information on the following three banking systems: the Federal Reserve Communications System (Fedwire) operated by the Federal Reserve System, the Clearing House Interbank Payments System (CHIPS) operated by the New York Clearing House Association, and the S.W.I.F.T. telecommunications system operated by the Society for Worldwide Interbank Financial Telecommunication S.C.

Specifically, you requested that we (1) provide descriptions of each banking system, including the purpose and date each system was established, the number of participants using each system, and data on the number of transactions executed through each system in 1987; (2) identify federal regulatory agencies providing oversight over these systems; and (3) discuss generic risks associated with these types of systems.

You also requested information on the flow of typical transactions through these systems and the names of officials of each organization responsible for oversight of Fedwire, CHIPS, and S.W.I.F.T. This information is shown in appendixes I and II.

DESCRIPTION OF FEDWIRE, CHIPS, AND S.W.I.F.T.

Fedwire is the nation's primary wholesale electronic funds transfer system in use today by the banking community to handle the payments banks make to each other on behalf of

themselves and their customers within the United States.[1] CHIPS is the primary wholesale electronic funds transfer system that supports the international transfer of funds between United States and international banks. On average, these systems account for daily electronic funds transfers of more than one trillion dollars. The S.W.I.F.T. system is a major international message processing system used by banking institutions to transmit information that is critical to initiating international electronic funds transfers through Fedwire or CHIPS. Flowcharts showing potential interrelationships between these systems in the processing of typical transactions are shown in appendix I.

Fedwire

Fedwire has been in existence in some form since 1918, and is the primary wholesale electronic funds transfer system in the United States. It is operated by the Federal Reserve System and connects the 12 Federal Reserve banks and their 25 branches, U.S. government agencies such as the Treasury, and some 10,000 depository institutions. In 1987, Fedwire processed approximately 55 million fund transfers with an aggregate value of about $153 trillion--over $695 billion, on average, every business day. About $81 trillion of Fedwire's dollar volume in 1987 (about 53 percent) was originated through the Federal Reserve Bank of New York. Transfers over Fedwire are considered both immediate and irrevocable, in that the Federal Reserve guarantees the payment to the receiving financial institution at the time the transfer is completed.

Fedwire also facilitates Federal Reserve open-market operations. In this regard it is used by the Federal Reserve, the Treasury, and depository institutions to transfer U.S. government and federal agency securities in book-entry form.[2] Nationally, 8.6 million securities

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[1]Wholesale electronic funds transfer generally refers to a funds transfer used to satisfy an immediate, high-dollar obligation or to enable the recipient to make immediate use of the funds.

[2]A book-entry security generally is not available in physical form. Rather, it exists as an entry on the books of the obligor or its agent. A Federal Reserve Bank records these securities on its books on behalf of depository institutions which, in turn, maintain detailed records of ownership. Securities are transferred between depository

transfers with a face value of about $102 trillion were made over Fedwire in 1987.

CHIPS

The CHIPS network was created in 1970 and is the nation's major wholesale electronic funds transfer system for processing international U.S. dollar transfers among international banks. This private-sector system electronically links 138 domestic depository institutions and branch offices of foreign banks, all of which are located in New York City. It is operated by the New York Clearing House Association. The Association was organized in 1853 to facilitate the exchange of such instruments as checks and coupons and for the settlement of accounts among its member banks. Since the advent of the Federal Reserve System in 1913, the New York Clearing House Association has concentrated on facilitating the clearing of financial transactions. The 12 member banks that make up the Association and the members of the Clearing House Committee are listed in appendix II.

CHIPS serves as the conduit for moving dollars between participant banks for transactions including letters of credit, collections, reimbursements, foreign exchange, and the sale of short-term Eurodollar funds. In 1987 CHIPS processed approximately 31.9 million transfers with an aggregate value of about $140 trillion--over $554 billion, on average, every business day. CHIPS transfers are not final until all transfers are reconciled and settled at the end of the day, through a settlement arrangement with the Federal Reserve Bank of New York.

S.W.I.F.T.

The S.W.I.F.T. system became operational in 1977 and was designed to meet the electronic communications needs of international banking. It is operated by the Society for Worldwide Interbank Financial Telecommunication S.C. The Society was created in 1973 to provide international automated message processing and transmission services between banks. It is a Belgian cooperative society which at the end of 1987 was owned and managed by 1,460 financial

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institutions for their own accounts or on behalf of customers utilizing the Fedwire network.

institutions located worldwide. The members of the board of directors of the Society are listed in appendix II.

As of December 1987, the S.W.I.F.T. system connected 2,360 institutions in 56 countries and processed about 1 million messages daily. The system has seven message categories covering more than 70 different message types that allow institutions to transmit among themselves instructions on international payments, statements, and other transactions associated with international finance. According to a senior S.W.I.F.T. official, statistics on the monetary value of messages processed over the system are not maintained. However, S.W.I.F.T. and New York Clearing House Association officials estimate that approximately 80 percent of CHIPS transfers are initiated by S.W.I.F.T. messages.

In June 1987, S.W.I.F.T. approved the acceptance of nonbanking institutions as participants in the system. Nonbanking participants currently approved to use the system include securities brokers and dealers, clearing institutions, and recognized securities exchanges. As of December 1988, 27 such participants worldwide had been approved to use the system; 14 of these participants are within the United States. Messages that are capable of being processed through this system include orders to buy and sell securities, confirmations that such orders have been executed, advice on the purchase or sale of securities, and associated delivery instructions.

FEDERAL REGULATION AND RELATED OVERSIGHT ACTIVITIES

Fedwire is subject to examinations by the Federal Reserve System. CHIPS has been the subject of joint examinations by the Comptroller of the Currency, the Federal Reserve System, and the Federal Deposit Insurance Corporation. The S.W.I.F.T. system has not been subject to federal examinations.

The Federal Reserve System has the dual responsibility of providing electronic funds transfer services through Fedwire and supervising and examining the funds transfer and other activities of the Federal Reserve Banks, branch offices, and member depository financial institutions. In this regard, the Federal Reserve Board examines Fedwire operations during annual financial examinations of reserve bank activities and periodic operations reviews of specific bank functions such as funds transfer. Specifically regarding Fedwire, these examinations and reviews are intended, among other things,

to help ensure that adequate internal control procedures are in place and are followed.

In addition to examination activities conducted by the Board, internal auditors from each of the Federal Reserve Banks conduct periodic audits that include review of Fedwire operations. The scope of these audits includes detailed assessments of Fedwire operations (such as controls over access to the system and reviews of various administrative, physical, and technical security features of the system). The internal auditors also follow up on any recommendations made by the Federal Reserve Board during its examinations and reviews. The Federal Reserve Board does not consistently use the services of outside audit organizations to review the operations of Fedwire. The last outside audit of Fedwire's system security was conducted in 1983.

The CHIPS system is examined jointly every 18 months by a team of examiners from the Comptroller of the Currency, the Federal Reserve System, and the Federal Deposit Insurance Corporation. According to senior officials of these agencies, the authority to review CHIPS operations comes from the Bank Service Corporation Act of 1962, as amended, (12 U.S.C. 1867). This act generally states that whenever a bank that is regularly examined by a federal banking agency enters into a relationship for the performance for the bank of any clerical, accounting, statistical, or similar function, that performance is subject to regulation and examination by the appropriate federal banking agency. Because the clearing function provided by the New York Clearing House Association is not specifically identified in this act, officials of the Association do not agree that the act gives any federal banking agency the authority to regulate or examine CHIPS activities. Nevertheless, the Association allows examinations to be conducted on an invitation basis. Since CHIPS officials have cooperated with the regulators there has been no need to resolve this question.

In addition to examinations by federal regulators, the CHIPS network is also subject to reviews by its internal auditor. A review of CHIPS internal controls and system security is also included as part of periodic external audits of Clearing House operations.

The S.W.I.F.T. system has not been subject to federal oversight. The chief inspector's office within the Society, which reports to its board of directors, performs audits of

the network on a periodic basis to ensure that messages transmitted over the system are private, accurate, reliable, and timely. In addition, a separate review of S.W.I.F.T. procedures to maintain the security and confidentiality of messages within the system is performed annually by an external audit organization.

GENERIC RISKS IN USING ELECTRONIC FUNDS TRANSFER SYSTEMS

Electronic funds transfer systems are computer-based telecommunications networks. The risks or threats to these kinds of systems can be generally classified into the following five areas:

-- Operating error--the inadvertent alteration, omission, or duplication of funds transfer data. Types include failure to initiate a funds transfer, initiation of a funds transfer for the wrong amount or to the wrong party, and initiation of a duplicate funds transfer.

-- Fraud--the unauthorized origination or alteration of funds transfer data. Fraudulent acts against an electronic funds transfer system are defined as intentional acts and can include the initiation of a fraudulent funds transfer request, the alteration of the terms (for example, the amount or beneficiary) of a valid request, and the purposeful destruction of records resulting in the erasure of a valid funds transfer.

-- Credit risk--the transfer of funds without the originators having sufficient balances. This threat involves potential risks to the participants in the funds transfer and does not involve automated systems per se. It occurs when a bank releases funds without having collected sufficient funds to draw against.

-- Disruption of service--the disruption of computer or telecommunications services due to such things as power failures, equipment and software failures, and natural disasters.

-- National security--the potential for the nation as a whole to be put at risk or coerced by the threat of disruption of one or more electronic funds transfer systems by, for example, terrorism or attack by external enemies.

The Office of Technology Assessment has identified some of these and other categories of threats to electronic funds transfer security.[3] Appendix III contains a summary of these categories.

In practice, these risks can be minimized by the application of good management practices that include a combination of sound administrative procedures, physical protection, technical safeguards, and the use of periodic internal and external audits.

Objectives, Scope, and Methodology

Our objective was to provide requested background information on the Fedwire, CHIPS, and S.W.I.F.T. banking systems, including (1) a general description of each system, (2) identification of the federal regulators providing oversight of these systems, (3) identification of generic risks in using such systems, (4) descriptions of how typical transactions are processed through these systems, and (5) listings of officials within each organization responsible for oversight of the systems.

To obtain a general description of each of the systems we obtained information and documentation from key senior officials at the Federal Reserve Board, the Federal Reserve Bank of New York, the New York Clearing House Association, and the Society for Worldwide Interbank Financial Telecommunication S.C. The information and documentation in this report on each system was designated by these organizations as generally being nonsensitive in nature and included data from annual reports and related informational brochures.

In identifying the federal regulators that provide oversight of these systems, we reviewed pertinent documentation on the responsibilities, power, and authority of the Federal Reserve System, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency. In addition, we obtained federal regulations and other related information from officials in each of the organizations and documented actions taken by the organizations to provide regulatory oversight over Fedwire and CHIPS. We also

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[3]The Office of Technology Assessment study is entitled Selected Electronic Funds Transfer Issues - Privacy, Security, and Equity, March 1982.

reviewed pertinent sections of the Bank Service Corporation Act of 1962 as amended, (12 U.S.C. 1867), which describes federal regulatory oversight responsibilities over bank service corporations.

To identify generic risks to electronic funds transfers between banks, we reviewed pertinent security literature describing various threats and vulnerabilities associated with electronic funds transfer systems. We also interviewed Fedwire, CHIPS, and S.W.I.F.T. managers to document their perceptions of the generic risks in using these kinds of systems.

Descriptions of how typical transactions are processed through Fedwire, CHIPS, and S.W.I.F.T., and information on each organization's oversight bodies was obtained from senior officials in each organization and a review of available supporting documentation. Our review was conducted in accordance with generally accepted government auditing standards, between November 1988 and January 1989.

We discussed the information contained in this report with senior officials of the Federal Reserve Board, the Federal Reserve Bank of New York, the New York Clearing House Association, and the Society for Worldwide Interbank Financial Telecommunication S.C., who generally agreed with the information as presented.

As arranged with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 21 days from the date of this letter. At that time we will distribute copies of this report to other interested members of Congress, executive branch agencies, and other interested parties.

This report was prepared under the direction of Howard Rhile, Associate Director. Other major contributors are listed in appendix IV.

Sincerely yours,

Ralph V. Carlone
Assistant Comptroller General

Contents

Figures

Abbreviations

CHIPS	Clearing House Interbank Payments System
Fedwire	Federal Reserve Communications System
GAO	General Accounting Office
IMTEC	Information Management and Technology Division
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunication S.C.

DESCRIPTION OF TYPICAL TRANSACTIONS PROCESSED THROUGH FEDWIRE, CHIPS, AND S.W.I.F.T.

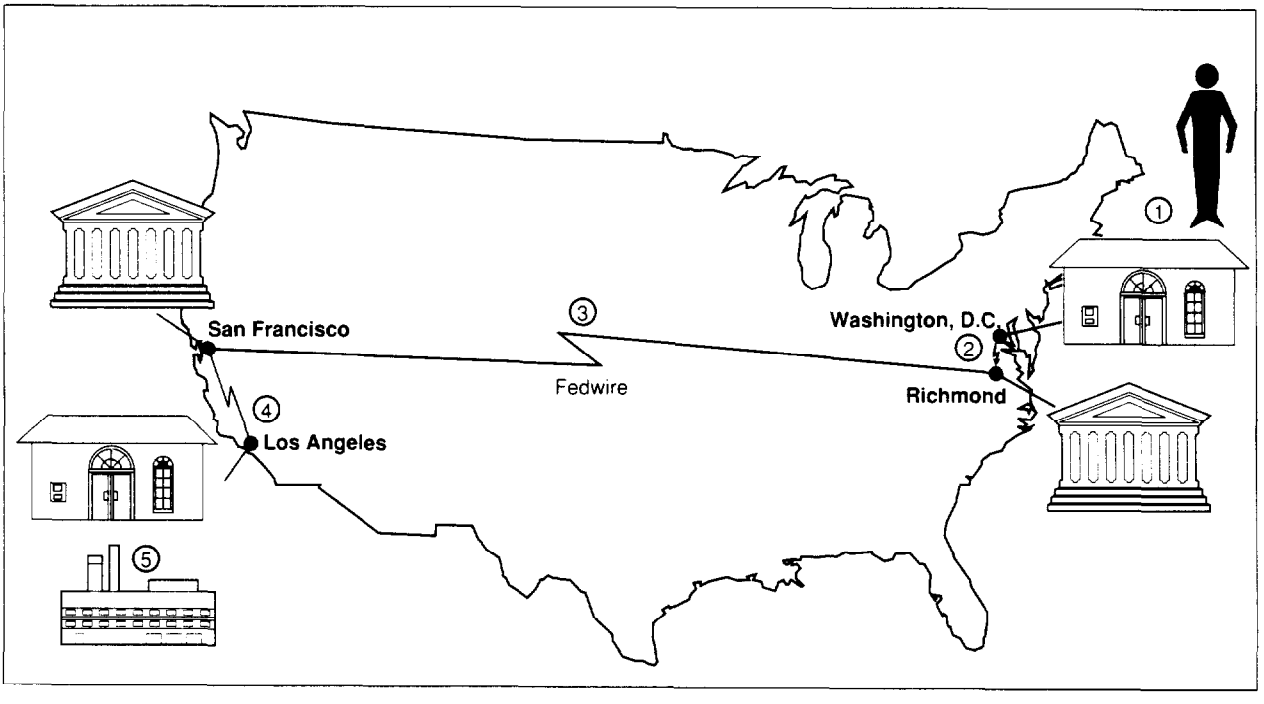
There are many different paths that transactions can take when funds are transferred among domestic and international banking institutions. The following examples are descriptions of typical transactions that could occur in executing electronic funds transfers using Fedwire, CHIPS, and S.W.I.F.T.

Example of a Domestic Electronic Funds Transfer Using Fedwire

Several different parties could be involved in a Fedwire electronic funds transfer. For example, a transfer could occur between a depository financial institution and a Federal Reserve Bank, or could also involve the financial depository's customers. In addition, Fedwire transfers can occur within a single Federal Reserve district (intradistrict) or between districts (interdistrict). The following example describes a Fedwire transfer between bank customers located in different Federal Reserve districts.

Figure I.1:

Example of Interdistrict Fedwire Electronic Funds Transfer



1. A Washington, D.C., purchaser wishing to buy $2 million in goods from a Los Angeles manufacturer visits a local bank to initiate a payment order.

2. The local bank linked to Fedwire uses a computer terminal to send a funds transfer message to its district Federal Reserve Bank in Richmond, Virginia.

3. The funds transfer message automatically proceeds over Fedwire from the Federal Reserve Bank of Richmond to the manufacturer's Federal Reserve district bank in San Francisco.

4. The funds transfer message is automatically sent from the Federal Reserve Bank of San Francisco to the manufacturer's local bank in Los Angeles that is linked to Fedwire.

5. After receiving the message, the local bank in Los Angeles notifies the manufacturer of the transfer.

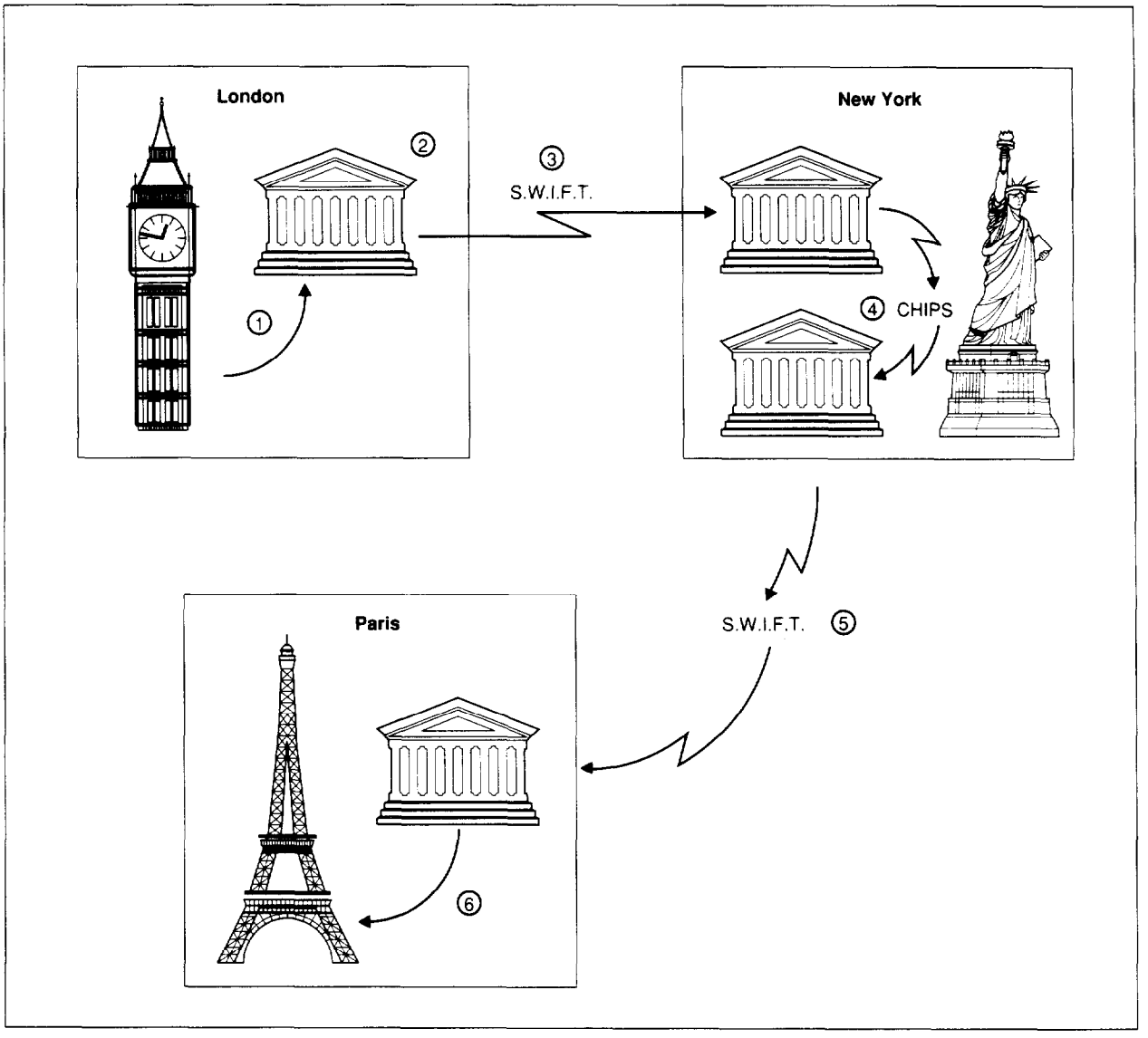
An intradistrict funds transfer is similar to the interdistrict transfer described above, except that in an intradistrict funds transfer the same Federal Reserve district bank receives the funds transfer message and forwards the transfer to the receiving bank.

Example of an International Electronic Funds Transfer Using CHIPS and S.W.I.F.T.

International electronic funds transfers between widely separated banking institutions may pass through a number of banks and networks in the course of a transaction. The following example describes an electronic transfer between bank customers located in different countries using the CHIPS and S.W.I.F.T. systems.

Figure I.2

Example of International Electronic Funds Transfer Using CHIPS and S.W.I.F.T.



Appendix I

1. A British importer orders goods from a French manufacturer to be paid in U.S. dollars.

2. After the goods have been received, the British importer instructs its London bank to send payment to the French manufacturer's Paris bank.

3. The London bank uses the S.W.I.F.T. system to advise its New York branch office to send payment to the manufacturer's Paris bank.

4. The electronic funds transfer is then sent through the CHIPS system to the New York branch office of the French bank.

5. The New York branch office of the French bank notifies its Paris office through the S.W.I.F.T. system of the receipt of payment.

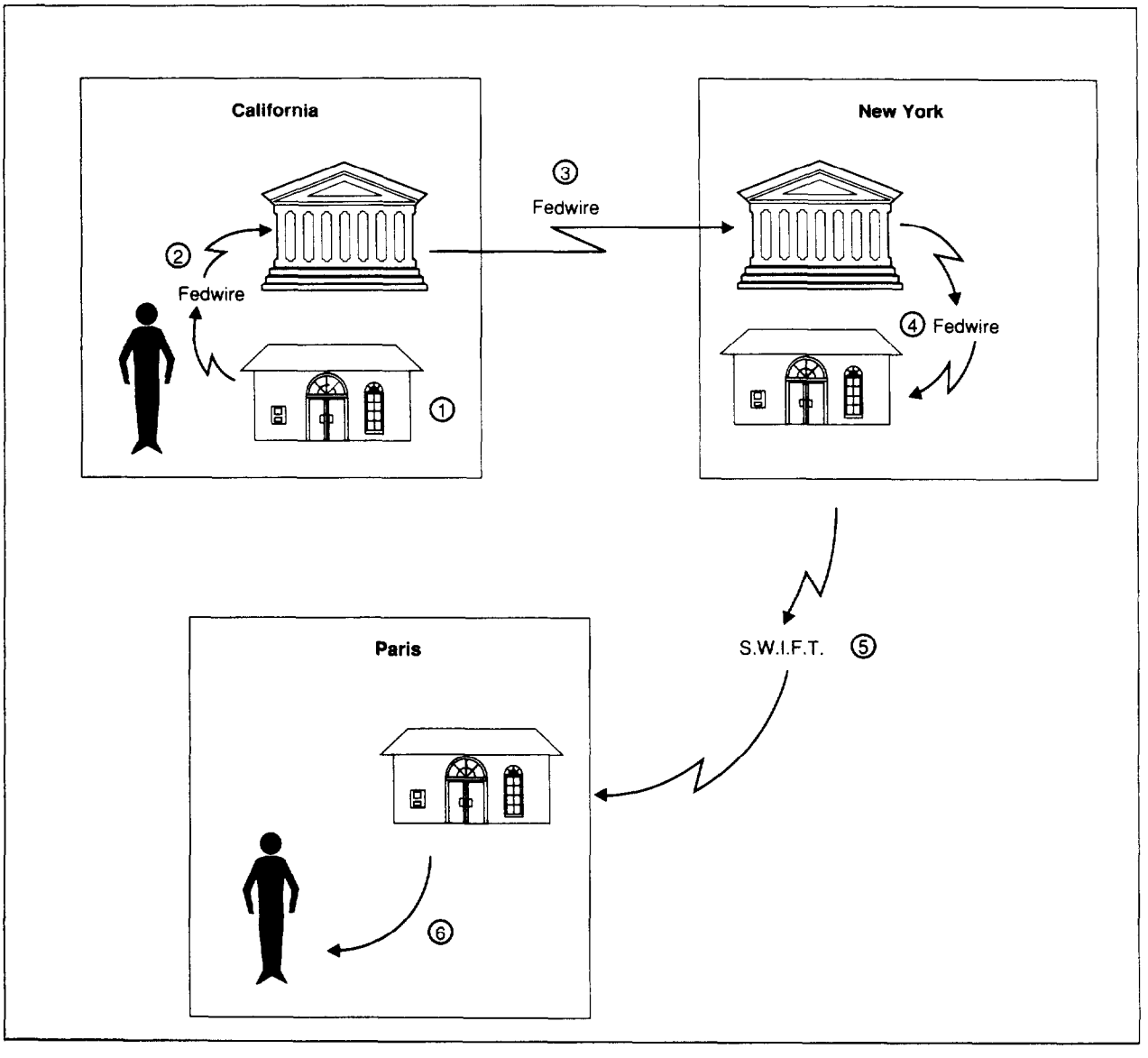
6. The Paris bank pays the French manufacturer.

Example of an International Electronic Funds Transfer Using Fedwire and S.W.I.F.T.

Figure I.3 describes an electronic funds transfer that could take place using the Fedwire and S.W.I.F.T. systems. This example is similar to the previous example, except that the transaction involves a Los Angeles importer making a payment to a manufacturer in Paris.

Figure I.3:

Example of International Electronic Funds Transfer Using Fedwire and S.W.I.F.T.



1. A Los Angeles importer instructs its local bank to send payment to the Paris manufacturer for goods received.

2. The Los Angeles importer's local bank that is electronically linked to Fedwire sends a funds transfer message to its district Federal Reserve Bank in San Francisco.

3. The funds transfer message automatically proceeds over Fedwire from the Federal Reserve Bank of San Francisco to the Federal Reserve Bank of New York.

4. The funds transfer message is automatically sent to a New York correspondent bank of the manufacturer's Paris bank providing a link between Fedwire and the S.W.I.F.T. system.

5. The correspondent bank uses the S.W.I.F.T. system to advise the manufacturer's Paris bank to send payment to the French manufacturer.

6. The payment order is received by the manufacturer's Paris bank and the funds are available on demand to the French manufacturer.

Appendix II

OFFICIALS RESPONSIBLE FOR FEDWIRE, CHIPS, AND S.W.I.F.T.

Members of the Board of Governors of the Federal Reserve System Responsible for Oversight of Fedwire

Board of Governors

1. Alan Greenspan of New York, Chairman
2. Manuel H. Johnson of Virginia, Vice Chairman
3. John P. LaWare of Massachusetts
4. Wayne D. Angell of Kansas
5. Edward W. Kelley, Jr., of Texas
6. Martha R. Seger of Michigan
7. H. Robert Heller of California

Members of the Clearing House Committee of the New York Clearing House Association Responsible for the Oversight of CHIPS

Chairman of the Clearing House Committee: Daniel P. Davison, Chairman, United States Trust Company of New York

Members

1. Willard C. Butcher, President, New York Clearing House; Chairman, Chase Manhattan Bank, N.A.
2. J. Carter Bacot, Chairman, Bank of New York
3. John S. Reed, Chairman, Citibank, N.A.
4. Walter V. Shipley, Chairman, Chemical Bank
5. Lewis T. Preston, Chairman, Morgan Guaranty Trust Company of New York
6. John F. McGillicuddy, Chairman, Manufacturers Hanover Trust Company
7. Samuel Chevelier, Vice Chairman, Irving Trust Company
8. Geoffrey A. Thompson, President, Marine Midland Bank, N.A.

9. Charles S. Sanford, Jr., Chairman, Bankers Trust Company

10. William T. Knowles, Chairman, National Westminster Bank, U.S.A.

11. Raymond J. Dempsey, Chairman, European American Bank and Trust Company

Members of the Board of Directors of the Society for Worldwide Interbank Financial Telecommunication S.C. Responsible for Oversight of S.W.I.F.T.

Chairman of the Board of Directors (S.W.I.F.T.): W. Robert Moore, Chemical Bank

Board Members

1. R. Frohlich, Deputy Chairman, Creditanstalt Bankeverin, Austria

2. R. Dawans, Generale de Banque S.A., Belgium

3. H. Nothstein, Dresdner Bank A.G., West Germany

4. R.H. Ross, Lloyds Bank plc, United Kingdom

5. P. Rapuzzi, Banca Popolare di Milano, Italy

6. L. Meijer, Amsterdam - Rotterdam Bank N.V., The Netherlands

7. E.F. Wagner, Deutsche Bank A.G., West Germany

8. N. De Seze, Banque de France, France

9. H. Hasselblad, Skandinaviska Enskilda Banken, Sweden

10. H. Huschke, Union Bank of Switzerland, Switzerland

11. D. Charlat, Societe Generale, France

12. H.B. Helgesen, Bergen Bank, Norway

13. J.A. Bignell, National Westminster Bank plc, United Kingdom

14. S. Ree, Canadian Imperial Bank of Commerce, Canada

15. M. Engeli, FIDES Informatik, Switzerland

16. E. Hansen, Privatbanken A/S, Denmark

17. J.E. Morgan, Commonwealth Bank of Australia, Australia
18. S. Newman, Manufacturers Hanover Trust Co., U.S.A.
19. T. Verho, Kansalis-Osake-Pankki, Finland
20. H. Hirano, The Bank of Tokyo Ltd., Japan
21. R. Polo, Banca Commerciale Italiana, Italy
22. M. Lopez Alvarez, Banco de Bilbao, Spain
23. S. Jordaan, The Standard Bank of South Africa Ltd., South Africa

MAJOR CATEGORIES OF THREATS TO THE SECURITY OF ELECTRONIC FUNDS TRANSFER SYSTEMS

Internal threats (within the institution)

System failure:

--Failure of computer programs
--Failure of hardware components
--Loss of data from system malfunction
--Deterioration of storage media
--Failure of communication links
--Failure of power

Employees:

--Greed, malice, ineptitude, accidents, disgruntlement, challenge
--Trojan horse (unauthorized procedures hidden within programs)
--Bogus transactions
--Unauthorized copying of data or programs
--Modification of data
--Unauthorized sale of data
--Destruction

External threats to system

Natural disaster (fire, flood, ice and snow, earthquake, etc.):

--Direct damage
--Lack of maintenance
--Overload at terminals
--Inaccessibility

Human:

--Criminals, terrorists
--Physical damage
--Destruction of data
--Modification of data
--Theft of data
--Fake transactions
--Impersonation of authorized user
--Forged access devices
--Unauthorized use of access devices

Source: Office of Technology Assessment, background report, Selected Electronic Funds Transfer Issues - Privacy, Security, and Equity, March 1982.

Appendix IV

MAJOR CONTRIBUTORS TO THIS REPORT

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