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24 March 1982

Japan Report

(FOUO 19/82)

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POLITICAL AND SOCIOLOGICAL

SUZUKI SEEN AS FLAGGING IN REFORM

Tokyo THE DAILY YOMIURI in English 5 Mar 82 p 4

[Political Beat column by Kenji Kitahara: "Flagging Reform Ardor"]

[Text] "Administrative reform is sort of a revolution. But only in the Meiji Restoration and in the postwar occupation under Allied Forces and Gen Douglas MacArthur did such a revolution succeed."

This is what former premier Nobusuke Kishi, nicknamed the "monster of Showa Era" because of his apparently everlasting influence in the political world, recently told Yasuhiro Nakasone, director-general of the Administrative Management Agency.

The veteran politician is well aware that bureaucrats are certain to vehemently oppose reform of this kind which may threaten to change the administrative organization and result in less power and authority for themselves.

His remarks may be considered a warning that administrative reform is not easy and may be a sarcastic jab at Prime Minister Suzuki who has pledged to stake his political career on this task.

In reality Suzuki, who once was so eager about this, seems to have lost interest to some extent although he still never fails to support administrative reform.

But the hidden intentions of the premier may have been revealed last Monday when he met Nakasone.

The Administrative Reform Council was scheduled to submit its basic report with recommendations for drastic reform in July and announce detailed points in its final report in March.

But Nakasone suggested to Suzuki that the basic recommendations be divided into part 1 and part 2 saying the compilation

task of the council had been delayed and that the Liberal-Democratic Party (LDP) did not want a single strong report that might jolt the government.

Suzuki lost no time in assenting to Nakasone's proposal. The two also agreed that recommendations covering such troublesome issues as reorganization of ministries and agencies and streamlining of government local branches will be carried in part two of the divided report.

Suzuki, who seeks reelection in the LDP presidential election scheduled for November, would like to avoid any situation which may disturb an extraordinary Diet session.

With the situation as it is it is believed that he would not like to have recommendations covering difficult issues carried in the report.

But this attitude seems to strongly indicate that Suzuki has cooled toward his promise to carry out administration reform.

With such a commitment, Suzuki should consider administrative reform more important than his reelection. But perhaps Suzuki did not realize, as Kishi did, how difficult the task would be when he made that commitment.

The premier really has been backpedaling on his pledge since the rice price increase carried out last summer.

We don't really know Nakasone's motivation for dividing the report. However, we do know that the people will be very happy if Suzuki is secretly determined to carry out the difficult work of administrative reform after he is safely reelected.

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POLITICAL AND SOCIOLOGICAL

ADMINISTRATIVE REFORM PLAN HITS SNAG

Tokyo ASAHI EVENING NEWS in English 3 Mar 82 p 5

[The Nation column by George Murakami: "Weekly Economic Review"]

[Text]

Eliminating waste in government has long been a favorite theme in big business. It has become particularly so since the 1973 oil crisis, to which business adapted by means of tighter management.

The abrupt shift from high economic growth rates to low has slowed down the rise in tax revenue, created big budget deficits and other fiscal problems and has led business to believe government can meet its financial problems as it did by a drastic tightening up.

This aim became a reasonable prospect last year when the Second Administrative Study Council was appointed last year and Prime Minister Suzuki declared he was "staking (his) political life on administrative reform" — reducing the budget deficit by slimming down the bureaucracy and with no increase in taxes.

Toshiwo Doko, a respected business leader named the council's chairman, accepted the post on the understanding that the Suzuki Government would take administrative reform seriously. Big business rallied solidly to his support and the leaders of the major business organizations formed a five-man committee to back him up.

Last week, big business held a rally, with about 400 business executives attending, to tell Doko he had its firm

backing. The gathering was held, however, because a split has developed between Doko and many of the council members—the council, like most governmental advisory bodies, consists of business leaders, conservative academics and senior bureaucrats.

Many of the council members, particularly the bureaucrats, want its report of recommendations to be made this summer, to limit itself to proposals that have some chance of being put into effect. In the Liberal-Democratic Party, warnings have been voiced that the recommendations must be "practical and reasonable."

Yasuhiro Nakasone, head of the Administrative Management Agency and the Cabinet minister responsible for administrative reform, has been making similar remarks. Prime Minister Suzuki, while he has continued to express his resolve to go through with administrative reform, seems to be hedging of late.

What Doko, his adherents and big business have in mind is much more drastic. They would abolish or merge many of the state-funded organizations, turn over their functions to local governments, the regular government agencies or private business. The state corporations — Japanese National Railways, Japan Tobacco & Salt Corp. and Nippon Tel & Tel—would be shifted

in whole or part to private enterprise.

Radical changes would be made in such big deficit producers as the rice subsidy and health insurance systems. Stiff controls would be placed on the payrolls and functions of local governments.

There is a great deal of featherbedding, waste, corruption and mismanagement which needs to be cleaned up but it won't be easy. Take JNR as a prime example. Its annual deficit is ¥1 trillion, going on ¥2 trillion. One idea is to transfer its trunk lines to private ownership (as was done with the power industry) or a "third sector" firm (mixed government-private firm like Japan Air Lines) and its local lines to local governments.

This plan for getting rid of the deficit by getting rid of JNR would be sure to run into formidable opposition from JNR's management and labor unions, the Transport Ministry bureaucrats, local business and political interests, the areas through which the new Shinkansen lines (which are guaranteed moneylosers) are to run and the many politicians involved.

Not many people can see Suzuki bulling his way through this kind of opposition. The "practical" people on the Doko council feel only a few cosmetic changes are possible such as having private firms taking over functions like track maintenance and shutting down the more hopeless local lines.

Japan Tobacco & Salt, as a fiscal monopoly, is geared to

make money but it could produce more revenue if cigarettes were simply taxed and the operation turned over to private enterprise.

Here again, though, the opposition from the corporation management and its labor union, the tobacco farmers (who get fat prices from the corporation), the thousands of tobacco retailers (who enjoy a closed market) would be formidable. Nippon Tel & Tel is a moneymaker now but its costs are rising and it will be in the red soon unless it raises its rates. Featherbedding and waste are notorious in NTT.

Big business support for Doko, moreover, may not be as solid as it appears. The people active in the business organizations are mostly board chairmen and counsellors—in Japanese business, these are largely honorary posts. The younger executives who run the companies tend to regard them as harmless old codgers playing industrial statesmen and making Colonel Blimpish "Gad, sir" statements.

What the younger executives want to see is not the fiscal austerity of administrative reform but something quite the opposite—a tax cut, stepped-up public spending and other measures to invigorate the economy. Again, businessmen in Osaka and the provinces are complaining that their elders in Tokyo, obsessed with this pet idea, are shutting their eyes to the increasingly serious slump in the economy.

As a practical matter, even the most drastic measures Doko may favor would result in

savings at most of several trillion yen. That would not be much in a ¥47-trillion budget and any savings would be quickly eaten up by the inevitable rises in outlays for welfare, defense, foreign aid, energy and other purposes.

Another trouble is that Doko and the other big business leaders have let administrative reform get entangled with irrelevant matters such as a tax cut and policy in management of the economy. Waste in government should of course be eliminated, and Doko should push here for all he can get.

Whether the savings from administrative reform should be used for a tax cut, as Doko and business are demanding, or for making possible no tax increases is another matter and, since rising budget costs will more than eat up the savings, an academic question.

Reduced fiscal spending resulting from administrative reform may have a deflationary effect on the economy but if the savings are used for more spending, say, on public works or a tax cut, the net effect will not be deflationary.

Moreover, the Government can go through with measures to eliminate waste and also undertake spending policies to stimulate the economy. This should not be made a case of one or the other. Doko and his backers (which include the media) would do better to concentrate on the question of more economical and efficient government and stay away from the tax and economic policy questions.

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POLITICAL AND SOCIOLOGICAL

UNITY OF CENTRIST FORCES 'ABSOLUTE MUST'

Tokyo THE JAPAN ECONOMIC JOURNAL in English 2 Mar 82 p 10

[Political Scene column by Ichiyo Hino: "Can Centrist Forces Really Attain Unity?"]

[Text] The just-ended convention of the Democratic Socialist Party (DSP) was originally designed to adopt the 1982 action program and consolidate preparedness for the coming "political Armageddon in 1983" when the Lower House election and unified local elections are slated. Discussions at the convention, however, revealed nothing but DSP's increasing agonies and irritation over its incapacity to obtain even a slight prospect for unifying middle-of-the-road forces and winning the helm of power.

The convention reconfirmed the previously needed polity that four centrist parties -- the Komeito (Clean Government Party), the DSP, the New Liberal Club and the Socialist Democratic Federation -- will cooperate in the future, but many DSP members have voiced serious doubts over the feasibility of unifying those four centrist forces in the convention. This is because, amid the controversy over the bombing gear of F-4 Phantom jet fighters in the Diet, only Komeito, among four centrist parties, has participated in voting on the 1981 supplementary budget. Others were the ruling Liberal Democratic Party (LDP) and the Japan Socialist Party (JSP). Komeito's action drove a wedge into the four middle-of-the road-camps.

Generally speaking, it is an absolute must for the centrist forces to unite and create a political environment in which LDP and the Opposition are very close. Otherwise, they cannot break up "the 1955 political formation" in which the present political setup,

led by the LDP and the JSP, was established. But, as many DSP members pointed out in the convention, the unification of the four centrist forces will be as fragile as glass if the Komeito, the most powerful among the four, drops out of line and takes the same action as the LDP and the JSP.

All this was quite instrumental in patching up the rift between the Komeito and other three centrist parties for the time being. From now on, the DSP should discuss their own party platform further and explain to the people about their stance in favor of the unification.

On the other hand, it was noteworthy that through discussions at the convention, the DSP's defense and security policy moved closer to that of the LDP, compared with those of the three other centrist parties. Especially over the F4 bombing gear issue, DSP Senior Adviser Ikko Kasuga and other leading officials expressed their intentions not to oppose the fitting of bombing gear to F4s because, they said, the military environment surrounding Japan has changed from 1968 when the Government decided to take off bombing gear from F4s. The definition of "threat to other nations, too," will change as time goes by. This way of thinking is exactly like that of the Government and the LDP and differs from that of the Komeito which has taken the stance of recognizing the defense force only to secure territorial integrity and is opposed to the possession of far-ranging fighter bombers.

Moreover, on three non-nuclear principles, the DSP

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announced last May when former U.S. Ambassador Edwin Reischauer stirred up an uproar over "the introduction of nuclear arms to Japan," that it could "possibly recognize the passage within territorial seas or the anchoring of nuclear vessels in future emergencies." This is the most "flexible stance" ever expressed by a centrist party on defense. Meanwhile, the Komeito has enunciated a new policy to formally "recognize the U.S.-Japan Security Treaty and the Self-Defense Forces." That is, those four centrist parties are in unison over the general defense policy, but are not necessarily in accord over specific cases, as clearly illustrated by the F4 gear issue.

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POLITICAL AND SOCIOLOGICAL

TROUBLED SOHYO-JSP RELATIONSHIP EXAMINED

Tokyo MAINICHI DAILY NEWS in English 4 Mar 82 p 2

[Nagatacho Doings column by Takehiko Takahashi: "Troublesome JSP-Sohyo Relationship"]

[Text]

The first meeting between the Japan Socialist Party's new executive committee and leaders of Sohyo (the General Council of Trade Unions of Japan) was finally held on March 1. When the decision on personnel was made earlier at the JSP convention, Sohyo opposed the selection of Noboru Baba as JSP secretary general. Chairman Ichio Asukata ignored Sohyo's demand and Baba became the secretary general.

Secretary General Baba was opposed not only by Sohyo but also by the anti-Asukata group within the JSP. Because Chairman Asukata forcibly made Baba the secretary general in the form of "the chairman's designation," Diet members belonging to the anti-Asukata group refused to accept any post in the executive committee.

Sohyo's Chairman Motofumi Makieda recently attended a meeting of the central executive committee of Denki Roren (the All Japan Federation of Electric Machine Workers' Unions). In his speech there, Makieda went so far as to say, "I cannot stand the JSP's actions any longer."

Under such circumstances,

the Japan Socialist Party's new executive committee had been unable to express its greetings to Sohyo, the party's most important supporting organization.

Sohyo held a meeting of its executives on March 1. At that time a proposal was received from JSP — that the new executive committee wanted to call and express its greetings. This was accepted and the earlier mentioned meeting took place.

At this first formal meeting between JSP's new executive committee and Sohyo leaders, Sohyo Chairman Makieda said, "I would like to see a united party structure formed." This was the same as the demand made earlier by the anti-Asukata group within the JSP directed to Chairman Asukata "to form a united party structure."

'United Structure'

The anti-Asukata group has also demanded the holding of an "extraordinary party convention in autumn to form a united party structure." Chairman Asukata does not seem to have given a reply to this one way or the other.

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Makieda seems to have said at the March 1 meeting that the demand for a "united party structure" does not mean "the replacement of Secretary General Baba." Both Chairman Asukata and Baba seem to have been greatly relieved by this.

Both Baba and Makieda have had relations with the Japan Teachers Union. There was at one time the "age of Chairman Miyahara, Vice Chairman Baba and Secretary General Makieda" in the Japan Teachers Union. Miyahara became a member of the House of Councillors and was chairman of the JSP's election committee.

Prior to the formation of the new executive committee, the relations between Makieda and Baba were not very good. Baba returned to Kumamoto and entered politics.

The reason why Baba and Makieda were not on good terms is not clearly known but it would not be a mistake to say that the relationship that existed between the two then is continuing to cast a long shadow now.

As seen by the Sohyo side, the Japan Socialist Party is able to maintain its position as the No. 1 opposition party solely because of Sohyo's strength. Sohyo is the main support enabling the JSP to gather campaign funds and votes.

The JSP received the strong influence of Sohyo. So much so that the criticism was heard that "the Japan Socialist Party

is Sohyo's political department."

But this time Chairman Asukata has emphasized the "establishment of the JSP's autonomy." He has ignored Sohyo's wishes in regard to the selection of the secretary general. That alone was disagreeable for Sohyo. But to add fuel to the fire, Baba, with whom Makieda is hostile, has been placed in JSP's very important post of secretary general.

This has aroused Makieda's ire all the more.

Although the first meeting between the JSP's new executive committee and Sohyo leaders has finally been held on March 1, this does not necessarily mean that the Sohyo is ready to repair the schism that has arisen with JSP's new executive committee.

Sohyo Secretary General Mitsuo Tomizuka has declared his intention to advance toward unification of the labor front, restudy of the path of socialism, and to hold talks with JSP's Baba in the future concerning the relations between the JSP and the Komeito.

Within Sohyo, however, there are views that "collecting funds for the '1983 year of political decision' should be frozen" in regard to the "one lung JSP executive committee" in which the right-wingers are not represented.

Can Chairman Asukata, who emphasizes "autonomy," completely repair the relationship with Sohyo? This is not an easily solved problem.

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TRADE FRICTION BREEDS ENMITY

Tokyo THE DAILY YOMIURI in English 21 Feb 82 p 3

[Behind the Scenes column by Minoru Hirano: "A Vicious Circle"]

[Text]

Questioned in the House of Councilors Budget Committee about the "reciprocity bills" introduced to the US Congress, Prime Minister Suzuki Tuesday replied that such endeavors by Japan as accelerated reductions of import tariffs and abolition of nontariff barriers (NTB) were not understood well enough in the US and this was due to deficient public relations.

The reciprocity bills call on the US Government to take legislative action to restrict imports from Japan when it is judged that US products are being shut out of the Japanese market. The Japanese Government is annoyed that though it is taking steps to correct the Japan-US trade imbalance, the US Congress does not appreciate such efforts at all but is hurling emotional blasts at Japan.

The lack of public relations efforts is not the whole problem. One top Foreign Ministry official said the root of the problem lies in the weakening of the world economy and that Japan should study what it can do to revitalize the world economy.

"The world economy" in this sense means the US economy. The Japanese side thinks that unless the US economy becomes stronger, there will be no end to US attacks on Japan.

More serious is that Japan-US psychological friction is intensifying. Chief Cabinet Secretary Kijichi Miyazawa once compared Japan-US trade friction and Japan-Europe trade friction and said that Japan and the US could hold a dialog on the basis of economic rationale and that things were simple, but Japan-Europe relations were much more complex and difficult to handle. But these ideas no longer apply.

The late French president Charles de Gaulle once labeled the late Japanese prime minister Hayato Ikeda "a salesman of transistors." The bogey of the "yellow peril" originated in Europe. Witness the

EC report which described the Japanese as workaholics living in rabbit hutches.

The US in the past rarely used such contemptuous words in reference to Japan. Recently, however, the US vocabulary has begun to resemble Europe's.

US Secretary of Commerce Malcolm Baldrige said at a meeting in Washington last December that Japan's cultural tradition itself was hampering opening of the Japanese market. Later, he told Japanese Ambassador Yoshio Okawara rather apologetically that his remarks were out of order. But in February, Baldrige repeated the expression at a meeting of the Joint Congressional Economic Committee. US Ambassador to Japan Mike Mansfield, back in the US temporarily, said that each nation has its peculiar cultural tradition, thus indirectly criticizing Baldrige.

The editorial titled "A Fatter Japan Is A Safer Japan" in the February 3 issue of the New York Times astonished the Japanese even more. The editorial said: "Japan has to be persuaded to expend less of its phenomenal energy on satisfying foreign consumers and more on improving living standards for its own people" and "... spend little, save much. The tradition has left Japan with a surprisingly low living standard, notably in housing." Just before that, Prime Minister Suzuki had told the Japanese that "enjoying freedom, peace and prosperity, Japan may without exaggeration be counted among the most blessed of countries today." What irony!

Some Japanese think that US blasts against Japan are due to "loss of self-confidence," "uneasiness about the future" and "jealousy toward Japan, a bright boy." But the US would get even more hysterical if Japan says so.

Trade friction breeds emotional enmity, which amplifies trade friction. This vicious circle should be broken.

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POLITICAL AND SOCIOLOGICAL

BUREAUCRACY BLUNTS ADMINISTRATIVE REFORM

Tokyo THE DAILY YOMIURI in English 23 Feb 82 p 2

[Editorial: "Bureaucracy Stunts Reform"]

[Text]

Attempts are being made by the Liberal-Democratic Party (LDP), government ministries and agencies, and private business leaders to mutilate the work being carried out by the second Ad Hoc Administrative Reform Council.

The council is currently concentrating on details of reports by its various working groups. If it succumbs to mounting pressures from vested interests, then this rare opportunity to give birth to real administrative reform will be aborted with serious consequences for the economy.

The backstage maneuvers by ranking officials of ministries and agencies to influence members of the council is particularly offensive. LDP Diet members with influence over the distribution of subsidies also are being approached. Even bodies affiliated with the government are lobbying to sabotage the reform.

Distressful Picture

We will not say that all the arguments of these groups are wrong but we will say they are all based on vested interests. Therefore, they all have become the enemies of administrative reform. And it is most distressful that some Diet members are pressuring the council too.

But the attacks against administrative reform are not limited to bureaucrats and politicians. Even business leaders are trying to foil the council's efforts.

This is surprising since it was the business community, which tightened its own belt to cope with the slowdown of the economy, that demanded that administrative reform be carried out for fear the economy would suffer from the malaise of Western nations. But with the stagnation of the economy, many of these business leaders with only near-term economic vision blamed austerity in public spending. They have dusted off the old theory that stepped-up public spending will stimulate the economy.

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Prod Government Again

What the business community should do is unite to demand again that the government carry through effective administrative reform. Although the Federation of Economic Organizations (Keidanren) is supporting the council's chairman Toshiwo Doko, the views of company presidents are diverse.

Fortunately at this critical moment, volunteers in financial circles are preparing to launch "a national forum to promote administrative reform." The entire business community should back this forum. At the same time, members of the council must stand firm against pressures and do their duty for the national good.

Although the ardor of the people for administrative reform has diminished from last year, nevertheless opinion polls show the public wants the government to carry out the necessary reforms. The people now must carefully watch the behavior of politicians and bureaucrats in their attempts to thwart those reforms.

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DIET OPERATION REMAINS UNDER LDP-JSP INFLUENCE

Tokyo MAINICHI DAILY NEWS in English 24 Feb 82 p 2

[Nagatacho Doings column by Takehiko Takahashi: "Diet Operation Carried Out On LDP-JSP Basis"]

[Text]

The National Diet is an institution that the people in general find difficult to understand. Since the Liberal-Democratic Party holds a stable majority in both the House of Representatives and the House of Councillors, it would seem that any issue, following thorough discussions, would be decided by a majority vote. Things are not necessarily quite that simple.

In discussing the supplementary budget draft for the fiscal year 1981 budget, the Japan Socialist Club took up the problem of remodeling the F-4 Phantom fighter planes.

Saying that even Prime Minister Zenko Suzuki was not fully aware of this problem, the government agreed to impose a freeze for some time on the funds intended for use in the remodeling. This compromise enabled the discussions to be resumed on the supplementary budget, leading to its passage.

There is no agreement, however, on when or in what way the freezing of the funds will be ended. In replying to an interpellation in the Diet, the prime minister stated that he would like to have the remodeling carried out as soon

as possible by the end of the current fiscal year (up to March 31).

If so, the "freezing" is in name only and has no substance.

The Democratic Socialist Party has expressed its opposition to the entire procedure, declaring that it is unreasonable for an item once included in the budget to be frozen. For that reason, the DSP boycotted the voting on the supplementary draft in the Lower House Budget Committee. The New Liberal Club followed suit.

Nor was it only the opposition parties. Director General Ichiro Nakagawa of the Science and Technology Agency disappeared from the Budget Committee.

Director General Nakagawa is dissatisfied by the fact that Prime Minister Suzuki did not know about the remodeling of the F-4 Phantoms. The same thing was included in the budget for the last fiscal year, just as it is in the budget for fiscal year 1982. It is impermissible for the person in the highest position of responsibility for the LDP not to have known about it. Nakagawa also asserts that when a budget

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is once determined, the right to carry it out rests with the government. To halt this execution is seen as excessive intervention in the right of administration.

A similar opinion was also voiced in the LDP's Executive Council. Eventually the Executive Council agreed to the move in order to save the JSP's face. Nevertheless, dissatisfaction still remains over the action taken by Prime Minister Suzuki and the executives. It is forecast that this will remain as live charcoal for kindling the fire for criticism of Prime Minister Suzuki.

Remodeling Plan

The plan to remodel the F-4 Phantoms has not only left live charcoal for kindling a fire within the LDP. It has also caused a problem in the middle-of-the-road parties. Not much time has passed since the Komeito, DSP and United Socialist Democratic Party inaugurated a joint Diet policy council. But this time the Komeito took joint action with the JSP in regard to the supplementary budget along a separate line from that of the DSP and the USDP.

This has been a big blow to DSP's Chairman Ryosaku Sasaki and adviser Ikko Kasuga who have been strongly advocating the coalescence of

the centrist parties. By unfortunate timing, this occurred just before the DSP's convention on Feb. 17. Within the DSP is a group critical of a coalescence which has started to shatter the coalescence scheme.

For this reason, Sasaki and Kasuga took steps to obtain the cooperation of the convention delegates so that Komeito Chairman Yoshikatsu Takeiri would not be severely criticized when speaking at the DSP convention.

The DSP is a political party which, as a matter of principle, has not rejected participation in Diet discussions. But it boycotted the voting this time. When the Komeito separated from the DSP and took joint action with the JSP, this was a big shock to the DSP.

Komeito Chairman Takeiri was able to speak safely at the DSP convention, but the split that has taken place between the Komeito and the DSP will not be easily bridged.

Upon observing the action taken by various parties in regard to the F-4 Phantom remodeling problem, it must be said that it will not be easy for the opposition parties to act in unity in calling for a tax cut.

Consequently, the operation of the Diet is likely to be, as it has been in the past, based on LDP-JSP talks. The middle-of-the-road parties may have little chance of entering the spotlight in center stage.

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POLITICAL AND SOCIOLOGICAL

ROLE OF MODERATE OPPOSITION PARTIES VIEWED

Tokyo MAINICHI DAILY NEWS in English 25 Feb 82 p 2

[Editorial: "Unity of Middle-Roaders"]

[Text]

The moderate opposition Democratic Socialist Party (DSP) and the New Liberal Club (NLC) have ended their party conventions. Each party showed enthusiasm aimed at unifying Japan's middle-of-the-road forces which plan to jointly gain power. The two conventions have showed us that such unity will not be easy to attain.

What do voters expect from the middle-of-the-roaders? In short, they want them to implement reform and activate Japanese politics. Many people are discontent about the longtime single-party rule of the Liberal-Democratic Party, which has resulted in inflexibility, bureaucracy and corrupt politics.

Many people, including even supporters of the ruling party, now want to see the emergence of a non-LDP government. We believe this to be a national feeling, and voters are placing expectations on the middle-of-the-roaders to play a leading role in this respect. Ryosaku Sasaki, DSP chairman, said in his speech at the convention that "Japanese politics is facing an historic turning point..." In its action policy, the NLC called for "an historic duty and role" for its members in unifying a wide-ranging rally.

We believe that the two parties have become aware of the role smaller parties must play from an historic viewpoint, and are trying to find a way to attain their purpose. They seem to believe that the time has come to change the domestic political situation. This trend is worth noting.

During the past few years, the Komeito, the Democratic Socialist, the New Liberal Club and the United Social Democratic parties have followed a trial-and-error course in spite of their slogan calling

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for unity. This indicates the difficulty of uniting political parties with different backgrounds and dogmas.

Prior to the NLC and DSP party conventions, disputes erupted among several parties concerning the "experimental remodeling" of the F-4 fighter-bomber. Differences were exposed between the Komeito and three other middle-of-the-roaders, deepening the latter's distrust of the Komeito.

It is said that any hasty move aimed at uniting the middle-of-the-roaders will not help them achieve their purpose. Timing is also important. Prudent and determined steps must be taken in concert, and in this respect, Seiichi Tagawa, representative of the NLC, emphasized the importance of three points in achieving unity: 1) fundamental rules must be respected; 2) talks must not be confined to just party leaders; and 3) basic recognition must be established on common problems. We support Tagawa's opinion.

In addition to unity, the four parties must know on what points they can agree and what programs they can put into practice. We say this because they can solidify their ties through actions in and out of the Diet. Earlier, the four parties created a liaison council for the promotion of nuclear disarmament prior to the opening of the second special United Nations General Assembly meeting on disarmament. We appreciate their efforts because this was their first joint action.

At present, the 1-trillion-yen tax cut demand is also an urgent issue for them. Whether or not they can unify themselves for this purpose will be a test. We also attach importance to Tagawa's statement which criticized the attitude of former Prime Minister Kakuei Tanaka who is on trial in connection with the Lockheed bribery scandal.

Addressing the fifth party convention of the NLC last Friday, Tagawa criticized Tanaka for wielding strong influence in the Liberal-Democratic Party and leading an LDP intra-party faction with more than 100 members. He called for Tanaka to immediately resign from his Diet post if he is found guilty by the Tokyo District Court.

We believe that the problems related to Tanaka's trial are closely related to the very foundation of party politics, and we are watching for possible reaction to Tagawa's statement from three other middle-of-the-road parties.

Some people believe that Japanese politics will

encounter rough sailing in the latter half of this year. In some cases, these moderate opposition parties may have to play an important role depending on the outcome of political developments. We hope that these parties will not try to reap a quick harvest but rather take action which is easily understood by voters.

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MILITARY

LDP TO STUDY U.S., USSR MILITARY SATELLITES

Tokyo SANKEI SHIMBUN in Japanese 11 Feb 82 p 2

[Text] The LDP's Special Committee on Space Development (Chairman Taro Nakayama) decided at a meeting on 10 Feb that it would re-examine Japan's space development activities because various countries are developing artificial satellites, including military reconnaissance satellites. The committee is planning to study the mechanisms and the operational space development systems of these countries. The committee will invite JDA officials to a meeting on 12 February to brief committee members on the status of the military satellites which the U.S. and the U.S.S. R. are developing.

LDP members interested in defense issues have been voicing their opinions for some time on the use of artificial satellite for peaceful purposes, saying that the JDA should start research and development of communication and reconnaissance satellites. However, the committee's position is that "we are just trying to understand the status of various countries' military satellites as part of our study to reexamine Japan's space development activities and that we have no opinion yet whether the Japanese should develop military satellites independently."

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SCIENCE AND TECHNOLOGY

NIPPON TELEGRAPH AND TELEPHONE ACTIVITIES REPORTED

FY-82 Budget Draft

Tokyo DENPA SHIMBUN in Japanese 1 Sep 81 p 5

[Text] Nippon Telegraph and Telephone (NTT) submitted its budget draft for FY-82 to the Minister of Posts and Telecommunications on 31 August. According to the draft, the corporation has an optimistic view and anticipates business revenues of 4,166,100,000,000 yen, a 6.3-percent increase over the previous year, even taking into consideration the effect of lower rates. The draft is characterized by an emphasis not only on the amount of money but also on the policy of improving the corporation's financial condition. Although the construction investment of 1.75 trillion yen is down 1.1 percent, the corporation hopes to accomplish its basic goals by reviewing objectives and making investments effectively. As for personnel increases, none are requested.

A 6-Percent Increase in Telephone Revenues

According to the FY-82 budget draft, revenues are 55.7 billion yen from telegraph services, down 5.9 percent; 3,688,300,000,000 yen from telephone services, up 6.1 percent; 310 billion yen from leased lines, up 13.0 percent; and 112.1 billion yen from miscellaneous sources, up 2.7 percent. The anticipated telegraph revenues include 28.6 billion yen from telegram fees, 24.1 billion yen from telex fees, and 3 billion yen from other fees. Due to a decrease in telex connections, total telegraph revenues are expected to fall by approximately 3.5 billion yen.

Telephone revenues are 1,106,700,000,000 yen from telephone user fees (893.1 billion yen from basic charges and 213.6 billion yen from supplementary service fees), 2,342,700,000,000 yen from telephone call fees, 137.2 billion yen from public telephone fees, and 101.7 billion yen from other charges (such as temporary telephone installation fees). The anticipated telephone call fees include 2,274,800,000,000 yen from direct-dial calls, 25.6 billion yen from operator-assisted calls, and 42.3 billion yen from pinkphone calls. The anticipated leased line revenues include 96.4 billion yen from general leased lines and 213.6 billion yen from leased data communications lines. Since the budget draft includes Sunday and holiday discounts and a lowering of long distance rates, this is a rather optimistic outlook.

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Business expenditures are held to 4,077,700,000,000 yen, a 6.6-percent increase, by trying to reduce the labor force and make it more efficient. Personnel expenses are 1,410,600,000,000 yen, up 8.5 percent when wage increases and scheduled increases are taken into account. Procurement is 655.6 billion yen, up 5.8 percent. Contracted business expenses (postal services, pocket bells, automobile telephones, and so forth) are 141.8 billion yen, a 10.3-percent increase. Depreciation expenses are 1.26 trillion yen, up 4.9 percent.

As for ratios relative to total expenditure, the highest three are personnel expenses at 34.6 percent, depreciation at 30.9 percent, and procurement at 16.1 percent.

Expansion of Minifax

As for construction, the general construction plan totals 1,285,900,000,000 yen, down 33.5 billion yen. Of this, the construction costs of service facilities are 281.8 billion yen (down 1.6 billion yen). This includes 1.2 million general telephone connections (1.3 million last year), the transfer of 2.1 million connected telephones (2.1 million last year), 40,000 connections of building telephones (40,000 last year), 640,000 extension telephone sets (670,000 last year), 750,000 business telephone sets (700,000 last year), 260,000 home telephone sets (220,000 last year), 71,000 public telephone sets (74,000 last year), 25,500 facsimile terminals (14,700 last year), and 46,000 silverphone sets (45,500 last year).

The most attention is being paid to the large increase in plans for push-button phones and facsimile. In regard to push-button phones, NTT anticipates a large increase by dividing push-button phones into two kinds--simple push-button phones with just the single push-button function and multifunction push-button phones equipped for simplified dialing and so forth. It plans to increase simple push-button phones by 720,000 units and multifunction push-button phones by 430,000 units. NTT anticipates a 70-percent increase in facsimile terminals. This includes the demand for minifax. Among the 25,000 terminals, 19,000 are minifax (12,000 terminals for public network use and 7,000 terminals for leased network use). The 71,000 units of public telephones are mostly those usable with 100 yen coins and also include those which accept magnetic cards.

Increase in Optical Communications Tests

The investment in general facilities construction, which belongs to the basic facilities category, is 580.8 billion yen, down approximately 27.2 billion yen. As for construction of new telephone offices, NTT plans to build 131 branch offices and 30 long-distance telephone offices, a total of 161 offices, down 64 offices. It also plans to install 87 sections of coaxial cable (102 sections last year) and 193 sections of microwave (203 sections last year). Concerning optical communication networks, the corporation plans to conduct commercial application tests in 13 sections (12 sections last year). Nine of the 13 sections are continuations of last year's work. The four newly assigned sections include one between Otemachi and Musashino-Mitaka, and one between Amagasaki and Shinfukuchiyama. Electronic telephone switchboards will be installed in 352 telephone offices (332 offices last year).

Expenditures include 44 billion yen for disaster prevention plans (50 billion yen last year), 362 billion yen for replacing facilities (358 billion yen last year), and 17.3 billion yen for expansion of connection districts (20 billion yen last year). As for expansion of connection districts (to expand from 5 km to 7 km in radius), the corporation plans to work in 110 of the approximately 2,000 connection districts to be expanded throughout the country. As a result, the number of households outside the connection districts will be reduced to approximately 6,000 by the end of FY-82. For these 6,000 households, NTT plans, as a measure for telephone network development in areas now outside connection districts, to promote a sparsely populated area communication system which enables formation of new connection districts in communities of more than 10 households in a 4-year plan from FY 82 through 85. In FY-82, the new plan will cover 3,400 households in 200 regions. Investment for expansion of connection districts is 17.3 billion yen, down 2.7 billion yen from last year.

Investment in data communication systems is approximately 106 billion yen (99.9 billion yen last year). It includes installation of 37,800 data communication circuits (24,600 circuits last year) and 29 systems for data communication facilities (26 systems last year). In addition, the draft includes 43 billion yen for research facilities (37 billion yen last year), 11.8 billion yen for development of telephone networks in remote rural areas (24 billion yen last year), and 57 billion yen for joint facilities (60.3 billion yen last year), and 246.3 billion yen for facilities and equipment (229.4 billion yen last year).

Control of External Borrowing

As for the capital supply plan, NTT intends to operate in accordance with its basic policy of controlling external borrowing. A total of 2,431,500,000,000 yen--including the 1.75 trillion yen required for construction plans, the 120 billion yen payment to the national treasury, and 561.5 billion yen for redemption of NTT bonds--must be supplied. NTT plans to meet these needs with 1,378,800,000,000 yen in external funds (1,120,700,000,000 yen last year). External funds are being reduced by a large margin.

Abolition of User Bonds

External funds consist of 254.2 billion yen from users' bonds (268.2 billion yen last year), 141.5 billion yen from facilities and equipment fees (143.5 billion yen last year), 170 billion yen from financial investments (150 billion yen last year), and 487 billion yen from special bonds and borrowing (559 billion yen last year). NTT is working in the direction of abolishing users' bonds in the future.

1.5 Billion Yen for Investments

Money invested in FY-82 is over 1.35 billion yen. Major investments are 34 million yen for Communication Satellites Organization, 590 million yen for Japan Automobile Telephone Service, 350 million yen for the New Japan Automobile Telephone Service, 25 million yen for the Okinawa Communication Service, and 50 million yen for Japan Electronic Technology. Losses of invested money are 90 million yen from the Captain System and 100 million yen for JATIC.

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Patent Agreement with IBM

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 20 Nov 81 p 1

[Text] Nippon Telegraph and Telephone (NTT) and IBM of the United States signed a cross-licensing agreement and a memorandum on the exchange of technological data at the NTT building in Uchisaiwaicho, Tokyo, on 19 November 1981. By concluding this agreement, NTT and IBM will have free access to each other's patents in the field of information processing systems. In addition, both parties can freely conduct a mutual exchange of engineers and technical information. Thanks to this agreement, large-scale and close exchanges in advanced technological fields are to be expected between NTT and IBM. IBM is the second company to sign a cross-licensing agreement with NTT. Western Electric of the United States has already done so. However, in the agreement with IBM, NTT has obtained subcontracting rights, which entitles it to license third parties to manufacture IBM patented products. The special characteristic of the agreement is that its conditions are not unfavorable for NTT, which does not have its own manufacturing division, in comparison with IBM, which is a manufacturer.

NTT reports that it held approximately 9,800 patents at the end of FY-80. On the other hand, IBM possessed over 30,000 patents. The contract specifies that the patents to be freely exchanged are limited to "those related to information processing equipment, including electronic switchboards, and do not include communications apparatus." Therefore, each party cannot freely use every patent possessed by the other. Nevertheless, since both NTT and IBM are superior in the information processing field and are proud of their technologies being the world's most advanced, technical innovation in this field is expected to accelerate hereafter.

Nowadays the telegraph, telephone, and data communications fields have all entered the electronic age. Telephone switchboards have been gradually replaced by electronic switchboards. In the area of information processing for communications, the conversion from analog to digital has been progressing. For this reason, the subjects for research and development at NTT are diversified. NTT is currently engaged in developing new technologies concerning electronics as a whole, such as development of VLSI's, which are the heart of an electronic switchboard, pattern recognition devices for transmitting not only voices but also pictures and hand-written letters, and optical communication devices.

As a result, the number of NTT patents has been increasing every year. The number of patents was 4,920 in FY-70. But it has reached approximately 9,800, almost double, in FY-80. Among NTT's patents, the prominent ones are semiconductor technology related to electronic switchboards and digital sign processing technology. The corporation's voice synthesizing technology has been widely used recently. The technology to synthesize voices is called the paakooru [phonetic reading] system. When composing a voice artificially, this system pays attention to information concerning the sound source which describes the characteristics of

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the throat and the shape of the mouth. Based on the information extracted, the system composes a voice. It has the characteristic of requiring only one LSI for the entire process. The method of manufacturing a low-loss optical fiber (in which a laser beam barely diminishes at all) the core of an optical communication system, is also NTT's own technology. These NTT technologies are at present at the highest level in the world. NTT patents are exerting a great influence on manufacturers in various countries as they develop new products.

On the other hand, IBM is the largest computer manufacturer in the world. IBM possesses over 30,000 patents. IBM also comes out on top in the world in the field of information processing technology. However, it was IBM which strongly sought the cross-licensing agreement with NTT. It is not clear where IBM's true intention lies. NTT Vice President Yasusada Kitahara said: "IBM explained that it was not after the patent for any particular NTT technology. Instead, it said that it be able to avoid inadvertent violation of NTT patents when developing new products if it had a general agreement on patents with NTT. That was why IBM wanted a patent agreement with NTT."

The merits of having a patent agreement with IBM are also great for NTT. NTT has also signed the same kind of contract with Western Electric, a wholly owned subsidiary of AT&T and the possessor of Bell Laboratories. However, because NTT does not have a manufacturing division, NTT cannot make use of WE's patents to manufacture WE-patented products. On the other hand, the agreement with IBM recognizes a subcontract right, which entitles NTT to contract with a third party to manufacture IBM-patented products. For this reason, a large effect is expected in developing Japanese information processing industry.

Initially, IBM wanted a free exchange of all patents, including those in the communication field. However, because IBM was not so heavily engaged in the communication field, both agreed on a contract which did not include the communications equipment technology except for electronic switchboards. As a consequence, Japan's state-of-the-art technology for optical communication systems is protected from diffusion into the United States. VLSI and other semiconductor technologies, to which attention has been paid recently and in which many technical innovations have been made, are to be exchanged.

On 19 November NTT and IBM also signed a memorandum on exchange of technological data as well as the contract on cross-licensing. Vice President Kitahara said: "this exchange has a greater significance to researchers." The memorandum was intended to promote the transfer of technologies between NTT and IBM through exchanges of researchers, discussions, and seminars. Kitahara said: "We have not decided anything specific yet. We are thinking of having a window for this purpose on both sides and to conduct exchanges item-by-item in the advanced technology field."

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Expansion of Overseas Activities

Tokyo DENKI SHIMBUN in Japanese 11 Jan 82 p 5

[Text] Nippon Telegraph and Telephone (NTT) will dissolve the present Overseas Liaison Room and create an International Bureau within the week. At the same time, the International Supply Policy Room will be dissolved and merged for the greater part into the International Bureau and for the lesser part into the Materials Bureau. Recently, NTT signed a patent agreement with IBM of the United States. In addition, industrial nations such as England and France have proposed technical exchanges with NTT. Moreover, NTT has been receiving requests for technical cooperation one after another from underdeveloped nations such as Thailand and Malaysia. Consequently, the present liaison room cannot sufficiently cope with all this activity. Furthermore, as a public corporation with the world's highest level of technology in the communications field, NTT must promote positively and strongly international cooperation and aid activities in the future. For this reason, it has decided to expand and strengthen the organization of its international division. The International Bureau will handle part of the work previously handled by the International Supply Policy Room. In the midst of ever-intensifying trade friction over communications equipment, the International Bureau will occupy an extremely important role in dealing with NTT's international policies, which include purchasing supplies overseas.

The Overseas Liaison Room has representative offices in Bangkok, Geneva, New York, Brasilia, and London. It (1) offers technical cooperation to underdeveloped countries, (2) exchanges technology and information with advanced countries, and (3) offers to cooperate in international conferences.

However, being a part of the government and the only enterprise commissioned to conduct communications business in Japan, the liaison room has had to conduct these activities in accordance with national policies in this field. For this reason, its activities were relatively passive at the time of establishment.

At present, however, NTT's communications network is second only to that of the United States and, moreover, it exceeds the United States by far in terms of stable administration. In addition, NTT's technologies have reached the world's highest level. For these reasons, the expectations and requests of various foreign countries vis-a-vis NTT's technical cooperation have been increasing more than ever.

Last November NTT signed a patent agreement with IBM of the United States. NTT also reached agreement on the exchange of technology with Western Electric of the United States. Recently, NTT has proceeded to give concrete form to a joint research project with AT&T.

Rurthermore, NTT has received a proposal from France to exchange advanced technologies such as optical fibers. The movement toward technical exchanges and cooperation with advanced countries has been intensifying.

On the other hand, proposals for technical cooperation from underdeveloped countries have been increasing. NTT signed a memorandum on exchange of technology

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with the People's Republic of China in 1980. Furthermore, Indonesia, Thailand, and Malaysia have approached NTT for technical cooperation.

Thus, NTT has decided henceforth to engage more positively in international activities with an emphasis on technical cooperation and transfer of technology. As a result, NTT is going to dissolve the Overseas Liaison Room and establish the International Bureau.

The International Supply Policy Room, which was established in October 1979, has been conducting purchasing procedures as a window for the purchase of communications equipment overseas. With the settlement at the end of 1980 of the Japan-U.S. problem concerning materials supply, the volume of clerical work has been increasing.

Under these circumstances, NTT established the International Supply Policy Committee to study how the work of purchasing supplies overseas should be dealt with in the future. With the establishment of the International Bureau, NTT decided to dissolve the International Supply Policy Room and to transfer its business to the International Bureau and the Materials Bureau.

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Study of Changes

Tokyo NIKKEI BUSINESS in Japanese 16 November 81 pp 42-53

[Article by Kimiaki Sudo, Yuji Sonomoto, and Yoji Koike]

[Excerpts] Nippon Telegraph and Telephone (NTT) has come to a turning point before its 30th anniversary (see Figure 1). Even though it has acquired the world's most advanced technologies such as optical communications, it is inevitable that the telephone business, from which the corporation's growth sprang, is going to shrink in the future. In order to leap into the future, "Doctor Shinto" has begun an operation intended to activate the huge organization of 330,000 employees by instilling profitmindedness and anticipating administrative reform. The goal is to move on to become the dominant force in the information industry. In order to do so, the corporation must get out from under the government's umbrella, which restricts activities as well as allowing an easygoing outlook. How to achieve autonomous management--therein lies NTT's difficulty.

The Shinto Revolution That Asks 330,000 Employees To Change Themselves

A revolutionary storm has been brewing in NTT, the chief temple of the information industry. It is intended to enforce strict official discipline and to accomplish administrative reform in advance. The man who sits in the center of the revolutionary storm is President Hisashi Shinto. It is already well known that he was appointed the president in the spring of 1981 to solve a large accumulation of difficult problems such as putting an end to false bookkeeping and to cope with

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the liberalization of access to circuits. Mr Shinto comes from the private sector and has nothing to do with the indecisiveness characteristic of bureaucrats. His logic is sharp and clear, and his actions are swift. Therefore, NTT's high officials are tense because they are unable to predict what he will say next.

One example is the budget request for the next year that NTT has submitted to the Ministry of Finance. NTT has compiled a business plan for the next year that assumes a manpower reduction--involving only 81 persons--for the first time since its founding in 1954. The report of the Provisional Administrative Research Council advised a personnel reduction. In the Diet, it has also been pointed out that, "compared with an electric company, a similar type of public utility, NTT has more employees and earns less money." Despite all this, a request for a manpower reduction from the corporation itself is still something never imagined in the case of the old NTT.

Labor-Management Consultations: Aimed at a Revolution in Consciousness

One aspect of NTT's change, the "Shinto Revolution," was observed in last October's dialogue between management and the corporation's labor union, the All-Nippon Telecommunications Workers' Union. Union members who watched President Shinto answer questions in the Diet on television criticized him, saying: "His objections to conversion of NTT into a private enterprise sound weak," or "It is not right that arbitration has been only partially honored." As the union's distrust and concern toward President Shinto rose, it proposed a meeting with management. The meeting was fruitful. Union President Kazuo Oikawa said: "We exchanged opinions more thoroughly than ever."

They had a discussion in elaborate detail on business plans and personnel problems, including "how to cope with sentiment for conversion of NTT into a private enterprise" and "how to establish a financial base." Of course, President Shinto did not accept the union's objection to conversion of NTT into a private enterprise as it was. NTT is supposed to study the feasibility both of converting itself into a private enterprise and of remaining a public corporation, and to report both the merits and demerits of each alternative to the Provisionary Investigation Council by the end of November 1981.

It is not that the union's assertions were accepted by President Shinto. However, union President Oikawa evaluated the talks, saying: "Although I cannot understand 30 percent of what President Shinto says, I can understand 70 percent. He is a fine man with really daring and unique ideas." This positive reaction also existed because all the corporation executives, including the president, vice president, and executive directors--the equivalent of all executives above the managing director level in a private company--attended the meeting and talked to the union officials for a full 2 hours. It used to be a case of "management cutting off the meeting after 30 minutes even though a 1-hour meeting had been promised. There had never been a meeting before that all of the executive directors attended."

President Shinto directly instructed the manager of the personnel department to arrange a meeting between management and the union, and the meeting was planned without any obstacle. The reason for this is perhaps President Shinto's judgment

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that it is better to have two channels, one channel through the organization and another through the union, in order to carry out reform and the revolution in consciousness smoothly." As for the reform, the president has already taken measures to prevent the corruption and balse bookkeeping that have often been the targets of the media. One measure was the appointment of a former general director of the Board of Audit as inspector to strengthen the internal auditing system. Another was a change in the accounting system.

Monthly Settlement: Efficiency Consciousness as in Private Enterprise

NTT had been operating under the so-called integrated revenue and expenditure rate system. This is a system that annually assigns each organ, a telephone official for example, a revenue target rate and an expenditure target rate. Under the system, as long as an organ achieves the revenue target rate, it can freely spend to the same degree. Briefly speaking, if one organ can increase revenue, it can also increase spending. This aspect of the system tended to invite corruption. This is one of the factors that allowed the occurrence of corruption amounting to 1.2 billion yen within 2 years. For this reason, President Shinto ordered the adoption of the monthly settlement system used by most private companies.

However, even though a different system has been adopted, it will be meaningless if each organ cannot produce good results. Therefore, President Shinto picks a region such as the Kinki or Shin'etsu every month and has all divisions within the region report their monthly statements directly to him. In the case of the Kinki region, there are 11 communications departments and each must report the contents of its monthly financial statements directly to him. This started in August. "We must count all revenues and expenditures. Then, we must also explain reasons for success or failure. When we cannot come up with good explanations for bad results, we receive the president's thunderous condemnation: 'That is not a reason at all.' Some managers who have been yelled at by him could not raise their heads during the rest of the reporting session." President Shinto does this thoroughly.

However, for ordinary private companies the monthly settlement system is now a matter of course. Taking a factor such as variations in the exchange rate alone, a private company cannot afford to have a leisurely annual settlement system. In order to insure profits, a private company must take measures promptly and needs to check its results as soon as possible. When we consider this fact, President Shinto's true intention in adopting the monthly settlement system may be to permeate the corporation's entire management with efficiency consciousness. Prevention of corruption is a side effect.

In fact, President Shinto has been acting vigorously since his inauguration to break down the lukewarm environment in NTT and to awake a consciousness for autonomous management. First of all, he took day trips to all 11 telecommunications offices throughout the country and gave lectures on NTT's basic management policy. Moreover, "since giving lectures is only a oneway street and I cannot hear the voices of employees in the field," he revisited all 11 telecommunications offices. The second time, at each telecommmunications office he called in about 20 officials of telephone office manager rank and exchanged opinions with them. He also directed that the contents of his meeting be reported to all employees

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throughout the country by means of NTT's internal newsletter. The number of NTT employees is 330,000. It is difficult to direct them all in the same direction. But, unless this is done, complete reform is difficult to carry out. Therefore, he chooses themes suitable to promote the revolution in consciousness in each division--one theme suitable for telephone offices, another suitable for research institutions--and thereby encourages employees. One example is the liberalization of the black telephone business. The black telephone is called the main telephone device in NTT's terminology. At present, sales and installations of black telephones are monopolized by NTT. But NTT is going to revise its regulations so that other private companies will also be able to sell and install black telephones.

Although it sounds simple to say liberalization of the black telephone business, it is a serious matter for NTT. From the user's standpoint, it has the merit of "enabling a customer to choose a telephone that he likes." Some people hold the opinion that "since there is no restriction on terminals for data communications, it does not make sense to have restrictions on telephones. They are an anachronism." However, liberalization of the black telephone business forcibly exposes NTT to competition from private companies in the same line of business. If NTT cannot compete and win, those employees currently engaged in sales and installations of black telephones will not have any work in the future. They have no choice but to try to improve work efficiency.

Image Change: Visible Research and Development

President Shinto recognizes the accomplishments of the NTT research institutions and engineers who have developed the world's most advanced technology for optical communications systems. He said: "There is no problem purely in the technical aspect. The transfer of technology from invention to the production stage is also carried out very smoothly." However, he also commented: "Researchers and engineers do not have a strong consciousness that they too have a responsibility for NTT's economic activities. This is because the leaders are too ignorant of the world. They cannot strongly sense society's needs. In other words, research for research's sake is not good. Researchers must conduct research that will produce things society needs."

A typical example of research and development that meets society's needs is the mobile equipment for both portable and automotive use developed by NTT's Yokosuka Electrical Communications Laboratory. This equipment with such a long name is, so to speak, a pocket telephone. It can be put in a shirt pocket. The director of the institute, Reijiro Fukutomi, said: "Whenever President Shinto saw me, he told me: 'I want you to develop it in the greatest hurry. It will replace the pocket bell and become a very promising service in the future. They will surely sell tremendously and become a source of profit for NTT.' I was repeatedly urged to hurry up development."

A pocket telephone was recently perfected and a prototype was shown to the public. It is in the we-hope-to-conduct-experiments-next-year (1982) stage. Why has President Shinto been pressing for early completion of pocket telephone development? Perhaps he has the intention of making pocket telephones a good example of research and development that matches society's needs. It is an example of the "research and development based on needs" President Shinto repeatedly has been urging upon

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NTT's researchers and serves as a stimulant creating a revolution in consciousness among the engineers. At the same time, he wanted to show a visible accomplishment to the public and tried to create a different image of NTT.

NTT is, in truth, a prime target for the administrative reform. However, NTT is also in a process of internal transformation. Regularly held meetings with MITI, which President Shinto suggested and started in August, symbolize NTT's transformation. NTT has been under the jurisdiction of the Ministry of Posts and Telecommunications. Although NTT has had discussions with MITI in the past over the future of the information industry, MITI has been basically a government agency with which NTT has had few dealings. However, NTT broke its own shell and approached MITI. This is a radical change from NTT's traditional attitude of being its own lord under the umbrella of the MPT.

Revenue Sources: New Kinds of Services

What is the true purpose of this change in NTT? Mr Toshiro Takahashi, the head of the Data Communications Headquarters, said that "the first meeting with MITI concerned development of the next-generation computer and the future of data communications." Herein lies the course on which NTT is setting itself. In brief, making the communication business a basis, NTT wants to go into the information industry. Precisely speaking, NTT intends to expand the scope of the data processing business, in which it has already been engaged a little, and to make it a source of future profit. President Shinto's presence at the enthusiastic announcement of the conception of INS (information network system) early last August made the corporation's intentions clear and specific. Briefly explained, INS is a plan that will enable the corporation to outgrow the limited telephone and telegraph businesses and to develop new kinds of audio and visual services such as minifax, which was introduced in large cities in the middle of last September, and the visual response system, which is currently in the experimental stage. Meetings with MITI can serve as a method to obtain MITI's understanding in order to proceed with NTT's business strategy in the future.

The final goal of NTT's transformation is a leap from its present position of "patron of the communications industry" to that of "patron of all industries." Because NTT-developed technologies such as optical communications and VLSI can be applied in robotics and other noncommunications fields, they can be a weapon to advance further the office automation that is presently one focus of public attention. Not only that, "NTT has an accumulation of technologies, although no longer advanced, that can still be useful in fields other than communications."

The reason NTT has been desperately trying to change itself is that NTT does not want to experience the "melancholy of AT&T," which has been shut off from the path of growth because its business is restricted to communications and cannot extend into the information industry. Putting aside discussions of NTT's management structure, the reason President Shinto urges efficiency consciousness upon employees and applies principles of competition to NTT's businesses is to realize the aforementioned intention of NTT. Internal reform by cutting off the old-fashioned and stick-to-the-old-customs bureaucratic way of business and implanting an enterprising spirit full of creativity seems to be the true feature of the "Shinto Revolution."

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The Organization, Money, and Joint Research That Build a Technological Kingdom

With the invention of the optical fiber and the VLSI, NTT's technological level moved to the world's most advanced (see Figure 2). The secret of strength in technological development is farsighted management at the top. NTT's technologies flow into the private sector through joint research. President Shinto wants to accelerate the flow. However, NTT's technical capabilities are insufficient in the basic research area. It is questionable how many more creative ideas NTT can produce in the future.

Optical Fiber: Recognized by the World

San Diego, California, USA. At the convention center in one corner of this port city an international academic society's convention is underway. The attendees number 600. A message from President Reagan is delivered. At this grand convention, a Japanese is the focus of attention. It is 39-year-old Mr Tatsuo Izawa. He is an NTT researcher (a research director at the Research and Development Headquarters).

This academic society is known as SPIE, the Society for Photographic Instrument Engineering. He received the Achievement Award. To researchers engaged in the study of optical communications, one of the leading-edge technologies, this award is perhaps one of the highest honors. Of course, Mr Izawa is the first Japanese to be awarded it. The date was last 26 August.

He wanted to have further contacts with other researchers in attendance at the convention, but he returned to Japan immediately. On 2 September, 1 week after the convention, he went to the NTT headquarters in Hibiya, Tokyo, to report to President Shinto concerning the award. It was Mr Izawa's first face-to-face meeting with the leader of 330,000 employees.

The conversation between the two did not end with just "congratulations" and "thank you." President Shinto: "What is next (target for research and development)?" Izawa: "Yes, I think it will be an optical IC, a circuit part for lasers." President Shinto: "Yes, I have been thinking the same thing." President Shinto's every word strongly impressed and also surprised Mr Izawa, who was more or less nervous in front of the president. President Shinto: "You certainly seem to be studying physics very well. But you are not studying this sort of thing, are you?" As he spoke, President Shinto handed a book to Mr Izawa. On the cover was the title, "Modern Thoughts and Dogen" [Dogen, who lived from 1200 to 1253, was founder of a major Zen sect].

Human Resources: Attracted by Research Funds They Gather

An optical fiber is a revolutionary material which reportedly will be a replacement for copper wire in the future. Although it is as fine as a hair, an optical fiber possesses the possibility of transmitting 10,000 times more information than the cables presently used. Mr Izawa received an award for developing a production method for "a fiber that a laser beam passes through." The production method is known to the world as the VAD method, the vapor phase axial deposition method (see Figures 3 and 4). The characteristics of this method are, in short, the three

elements of "continuation," "mass production," and "high speed." These characteristics have been a long-sought dream of researchers in optical technology.

It was in the spring of 1975, just after he returned to Japan from study in the United States, that Mr Izawa started to engage himself seriously in research on optical fiber. He was assigned to NTT's Ibaragi Electrical Communications Laboratory. His rank was research special investigator in the Dielectric Materials Research Office. Only two men, Mr Shoichi Sudo and Mr Fumiaki Hanawa (at present, both are in the Optical Materials Research Office and Mr Sudo is a chief researcher), helped Mr Izawa. A team of only three men started the research in early 1976.

It was in October 1976 that they could see a slight light in their research. A mass of chalk-like glass (a porous basic material) became transparent as it was being heated. "We did it!" The three men reported it to their boss and then went to Mito to have a small celebration....

Mr Izawa now recalls his past experience as a researcher and sometimes wonders "if I had stayed at the university, could I have done this sort of research?" The true reasons he entered NTT were materials and money. In other words, he was attracted by NTT's abundant research funds and facilities. He said: "My research team spent a nine-digit sum of money in 3 years" to develop the VAD method.

Moreover, it was a technology where "we were unsure of success" (Mr Izawa). It is a technology a private research institution could not develop by itself.

Why is NTT strong in developing technologies? In searching out the secret of NTT's strength, we have concluded that it is materials, money, and human resources. It is common knowledge that the best electrical engineering students enter NTT. Mr Izawa's professor, Masahide Kamiyama, a professor emeritus of Tokyo University, highly praises Mr Izawa, saying: "Mr Izawa did very good work when he was in graduate school, too."

Mr Izawa passed the most important period for a researcher in the latter half of the 1960's and the 1970's. During that period, not only NTT, but all of Japan was rigorously engaged in advancing technological development and caught up with and overtook the United States and Europe in the advanced optical fiber and VLSI technologies. Being in the midst of the development of these technologies, he was blessed with good luck as a researcher. Mr Izawa is in a sense a man symbolizing NTT's developing technologies.

VLSI: Pushed by Organizational Power

What is NTT's technological level in the VLSI field, one of the corporation's two advanced technologies? This can also be said to be at the world's highest level. Let us take as an example the question of how many elements (such as transistors) can be integrated on one chip. In the case of the memory chip called a RAM, which can be randomly read out and write in information, NTT developed the world's first 256 kilobit VLSI in 1980 (a bit is the basic unit of information). It is a VLSI that can contain 600,000 elements on a silicon chip only 6 millimeters square.

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The next target for development is, in the case of the RAM, the 1 megabit (1,000 kilobit) chip. It will be a VLSI with four times the integration of a 256 kilobit chip. Once this is perfected, an entire TV screen can be stored in one chip.

In the case of both the optical fiber and VLSI, for which NTT now enjoys the world's highest reputation, NTT's research was behind that of the United States until a few years ago. Yasushi Takahara, the chief of the Research and Development Headquarters, commented that "the semiconductor technology of NTT's Electrical Communications Laboratories was ignored by other people before." How could NTT catch up with others so quickly? It is not sufficient to explain simply that NTT had all the materials, money, and human resources. More than anything, it is because of the strong management of research and development at the top.

In the spring of 1974, Shigeru Yonezawa, then president of NTT, (currently the chairman of the Telecommunications Association), instructed the leading researchers that "it is not good just to follow behind the world's leaders. It is necessary to advance basic research more positively in the 1975-1985 decade. I would like you to think of three subjects for this research."

As instructed by the president, the Technical Bureau of the headquarters and leading members of the laboratories discussed the matter for about 6 months. As a result, they came up with three subjects for research: optical fibers, VLSI, and digital technology. In order to develop them, the president ordered "a considerable expansion and improvement of the research organizations." For example, the number of researchers engaged in development of the VLSI increased from 150 to 500 in one effort. We were surprised to discover how much effort NTT had concentrated on research.

In the case of optical fiber, too, if it had not been a definite target of the organization, the technological level probably would not have reached the world's highest. Isn't the reason why Mr Izawa succeeded in developing the VAD method, about which he was initially "uncertain of success," that the entire organization was moving in one direction?

Joint Research: Utilizing Competition Between Companies

Moreover, joint research with private manufacturers may have contributed to NTT's technological success. In regard to the joint research system, not a few people point to the adverse effects of "NTT's collusion with certain manufacturers." As far as technological development is concerned, however, we can give great credit to this system.

The manufacturers who joined with NTT in joint research were four electrical cable makers, including Sumitomo Electric Industries in the case of optical fiber and the triumvirate of Nippon Electric Company (NEC), Hitachi, and Fujitsu in the case of the LSI. Although it was called joint research, the experimental facilities of each partner were separate. Manufacturers never got together to conduct research. NTT's researchers and the manufacturers' researchers sometimes used the same basic experimental facilities together at NTT. But it was always NTT's researchers together with one manufacturer's researchers at any one time. Although technologies were transferred from NTT to the manufacturers, "they were never transferred

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between manufacturers, nor did NTT intermediate such transfers," said Nobukazu Niizeki, the director of NTT's Ibaragi Electrical Communications Laboratory.

Manufacturers are divided in joint research. Consequently, competition among manufacturers is very severe. Moreover, "NTT decides how many orders each manufacturer will get in accordance with how much each manufacturer has contributed to the joint research" (Oki Electric Industries Company President Masao Miyake). Therefore, each manufacturer cannot help but try hard. The managing director of NEC, Michiyuki Uenohara, said: "Consciousness of competition among researchers in NTT's joint research is totally different from that of researchers at Bell Laboratories in the United States, where the manufacturer is within the same organization." Of course he means that Japanese researchers have a stronger consciousness of competition.

What is the merit of this for the manufacturers? The greatest merit is that NTT's basic technologies flow to manufacturers through joint research. Let us take the example of the VLSI. Oki Electric Industries Co developed a 1 megabit ROM chip through joint research with NTT. "The technologies our researchers acquired through the joint research contributed to the production of a kanji [Chinese character] printer" (President Miyake). Furthermore, this is the easiest way for manufacturers to get the most up-to-date information on technologies. Of course, joint research also guarantees manufacturers a purchaser, NTT, for the product. In addition, Tsuneo Nakahara, the head of Sumitomo Electric Industries Research and Development Headquarters, says: "Since a specific target for research and development is given in joint research, it is easy to work with."

To NTT, the joint research system may be quite convenient because it forces manufacturers to compete while raising the technical level of each manufacturer.

The transfer of technologies through this type of joint research is certain to become more and more important in the future. Considering the fact that semi-conductors are used in many fields of industrial machinery and household goods, the influence of NTT's technology extends across extremely wide areas.

President Shinto emphasizes the utilization of NTT's accumulated technology. By doing so, he does not mean only the transfer of technology through joint research. In addition, he intends to transfer NTT's technologies to the private sector through Nippon Technology of Electrical Communication (NTEC--organized by former employees of NTT's Electrical Communications Laboratories). Technologies developed by NTT's research institutions are sold to NTEC, and the NTEC sells them to private manufacturers. One example is the voice synthesizing technology called paakooru [phonetic]. President Shinto seems to fire up NTT employees when he says: "Let's promote this sort of transfer of technologies and earn more." In line with the intentions of President Shinto, last October, the chief of NTT's Research and Development Headquarters instructed each laboratory "to list technologies which can be used by private manufacturers."

A Worry: The Thin Layer of Basic Researchers

NTT's research and development division seems to be running very well. But it also seems to have many problems.

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One of them is a problem of materials supply. According to new regulations promulgated at the end of last year [1980], NTT will give more opportunities to foreign manufacturers to participate in supplying material to the corporation. Of course, NTT's management will benefit if competition among manufacturers becomes more severe and thereby lowers the cost of supplies. However, if an unfamiliar manufacturer joins research projects that have been conducted with only certain manufacturers, efficiency in research may fall. Hiroo Toyoda, the former director of NTT's Musashino Electrical Communications Laboratory asked if "it won't be difficult to retain technological continuity." Some researchers say that "this is the most serious crisis since NTT's laboratories were established."

An even more serious problem is the size of the corporation's research capabilities. Let us compare NTT with Bell Laboratories. The number of researchers at Bell Laboratories is approximately 26,000. Among them, those engaged in basic research number 1,500-1,600. On the other hand, at NTT only 200 out of 3,100 researchers are engaged in basic research. Bell Laboratories is in a completely different class from NTT. Moreover, Bell Laboratories even has geneticists and psychologists. Will this difference in basic research capabilities not affect future competition in the development of advanced technology? In particular, in the development of basic technologies?

"Japanese research has been always conducted for the purpose of improving efficiency. Researchers knew what to make and how to make it. However, when we do not know what to make in the future, our method of conducting research will not be effective any longer" (Mr Toyoda).

This crisis mentality seems to be shared by research managers themselves. Takahara, the chief of the Research and Development Headquarters, said with tension showing in his face: "A strategy formulated around 1974 almost by accident turned out well. This is the truth of NTT's success. There is no guarantee that our strategy will turn out well next time. We cannot afford any mistakes in formulating strategy hereafter."

As is often pointed out, in the case of both optical fiber and the VLSI, NTT has developed more practical forms of a technology. Researchers have been working hard on matters such as reduction in the loss of the laser beam and increases in the degree of integration. NTT's improvement of these technologies have almost reached the limit. If a completely new type of advanced technology or compound technology is developed in the United States and Europe in the future, can Japanese researchers, who are so used to improving already invented technologies, compete with U.S. and European researchers?

We asked a researcher outside NTT about this. Professor Jun'ichi Nishizawa of Tohoku University (the Telecommunications Research Institute) is a pioneer in optical communications.

"It is true that NTT's development capability is number one or two in the world. However, it is not yet sufficient in terms of developing unique, creative ideas." President Shinto may be keenly aware of problems like these, for he himself is an engineer. We seem to hear him saying: "Future technological development cannot emerge from a way of thinking based on the past framework." Didn't President

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Shinto try to give advice to NTT's researchers in the guise of the book given to Mr Izawa?

The Achilles' Heel of Management That Is Inefficient and Makes Light of Needs

Though it is a technical kingdom, NTT has many serious management problems. It cannot get rid of the government-will-foot-the-bill way of business which is inefficient and ignores people's needs. One goal of NTT is to expand its services in fields other than telephones. However, in those fields it faces an accumulation of problems, such as criticism for being a monopoly and competition with private companies. The future of NTT depends on whether or not it can succeed in realizing the concept of INS. However, more immediate problems are to improve its financial condition, to reform the fee structure, and so forth.

18 Versus 2: A Big Difference from Private Companies

The work done by 2 people in private companies is done by 16 to 18 people at NTT. This is an excerpt from the shocking remarks in the "Report on the Results of an Administrative Review of Data Communications" published by the Administrative Management Agency last July. This is a comparison of the manpower NTT and computer service company "M" require to maintain the online business of a mutual financing bank. Moreover, this is only a comparison of dayshift workers on weekdays. The report goes on to say that M assigns nobody to work on Sunday, while NTT assigns five people to work on Sunday. The report sharply highlights NTT's inefficiency.

To this criticism, NTT offered the excuse that "we needed many workers because the computers frequently broke down in the past" (Toshiro Takahashi, chief of the Data Communications Headquarters). But it also recognized that "we certainly had too many employees on the job." This example is only the visible peak of an iceberg. Nevertheless, it clearly shows the inefficiency of NTT based on "the government-will-foot-the-bill" way of thinking that is still deeply rooted in NTT.

Since NTT is an enormous organization with annual business revenues of 4 trillion yen, waste also accumulates on an enormous scale. Since domestic telephone service is monopolized by NTT, the corporation's productivity in this field cannot be compared with any other entity in Japan. Therefore, let us compare NTT with AT&T, which provides approximately 80 percent of all telephone service in the United States. AT&T's business revenues and number of employees are almost three times those of NTT. When we compare productivity in FY-80, NTT's sales revenue per employee of 12 million yen is considerably less than the 14.1 million yen in the case of AT&T. As is shown in Figure 5, AT&T's superiority in this respect has not changed for the past five years.

When we compare the productivity of money, gross interest burden as a percentage of sales--financing expenses as a percentage of total revenue--is 11.2 percent for NTT and 7.4 percent for AT&T (in FY-80). AT&T is superior in this respect, too. It is obvious that AT&T's net profit as a percentage of employed total capital, which is a general indicator of earning power, is much more stable than NTT's.

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Criticism: Services Without Service

As has been already mentioned in detail, we have no doubt about NTT's technological superiority. However, it is questionable that NTT utilizes such a "treasure" to the full extent. NTT's method of business is somehow amateurish. NTT does not do business in ways that suit customers' needs or offer special products or services that customers want. One example is DEMOS, a scientific and technical calculation service, one of the two main services of the Data Communications Division, which has been recording an enormous deficit along with the Telegraph Division. The service hours for this system are from 8 am to 10 pm. Considering that customers who use this sort of service often work at night, NTT cannot be said to be offering the most convenient service. There are some private companies in the same line of business that offer 24-hour service. Consequently, the difference in service between NTT and private companies is obvious.

In the case of DRESS, a sales and inventory management service, another of the principal services of the Data Communications Division that uses public circuits, service hours are from 8 am to 8 pm. With these service hours, it is only natural that "users have not increased as we initially planned" (Mr Takahashi). Moreover, these services are intended primarily for small- and medium-sized businesses. Recently, however, small- and medium-sized businesses have tended to use personal computers and office computers. Therefore, NTT has to compete intensely with these small computers. This is directly related to the failure to increase revenue from these services. An organization that grew up in the telephone business where it had a monopoly naturally has a difficult time in the competitive market. Moreover, competition with private companies is expected to be more and more intense in the future. A delay in responding to market needs may become fatal for NTT.

NTT has exhibited this tendency from the beginning, but recently criticism and questioning in various forms, such as the idea of converting NTT into a private enterprise and requests in the Provisional Administrative Research Council to open NTT's circuits, have been increasing. The desire for "a telephone installed at once" and "a telephone connected at once" was shared throughout the nation in the past. For this reason, people rarely questioned the rationale for NTT's existence. At present, however, when the long waiting list for telephone installation has diminished and telephone calls can be made by direct dialing throughout the nation, it is no wonder that the voices questioning NTT's existence have been getting stronger. Because NTT itself has been placing emphasis on services other than telephones which are the fields expected to grow in the future, many people criticize NTT's monopoly from the standpoint of efficiency and opine that NTT could be activated through conversion to a private enterprise.

INS: A Business To Revive NTT

The strongest weapon to deal with criticism of NTT would be development of a business that insures the significance of NTT's existence. It is the concept of INS that, under President Shinto, NTT as a whole started campaigning for this year. Although NTT has possessed the concept of INS for a long time, it is only in this time of severe criticism of NTT's management that NTT has started vigorously to campaign on the outside for the concept of INS.

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The INS concept would replace the existing telephone network, which uses analog signals transmitting sound waves as electrical waves, with a digital network using digital signals that transmit information as a combination of "1" or "0." In this way, DDX, the new data communications network that NTT began to establish in 1979, the facsimile network that NTT started servicing last September, and the nationwide telephone network can be completely integrated.

According to NTT's explanations, as illustrated in Figure 6, with the completion of the INS telephone, facsimile, data communications, and visual communications can be passed through one network at low cost. Furthermore, various services are computed according to the volume of information, so the fee structure can be rationalized and the distance differential in the telephone rates can be eliminated. In addition, INS enables us to make a telephone call and use facsimile or data communications concurrently. INS is, so to speak, a get-three-birds-with-one-stone system. For this reason, if the INS is completed, office automation will be further promoted. It will then create a new work system under which people work at home, or work places and residences are brought together. Such a blueprint has been drawn up.

If the necessity of INS is recognized, a strong step will have been taken in the direction of restoring the significance of NTT's existence. No one other than NTT can maintain a nationwide network that combines state-of-the-art communications technologies such as optical fiber and the most advanced computer technology.

It is also true that an enormous amount of money is required to complete INS. NTT is supposed to invest over 10 billion yen in the experiment by 1984. This does not seem to be a big burden on NTT, which has earned net profits of approximately 400 billion yen in the past 4 years. However, management is gripped by a strong crisis consciousness concerning NTT's financial base. Although President Shinto has recently avoided saying so for internal reasons, when he first became president he often said: "If the ratio of financing expense to total revenue reaches 11 percent, a private company would go bankrupt." Certainly, the burden will become heavy because NTT's payments on principle and interest will exceed 1 trillion yen a year hereafter.

Capital: Finances Far from an Offensive Posture

Some people say that the interest burden is naturally heavy because the communications business is a typical public utility. A heavy interest burden does not matter because NTT can absorb the burden and still make a profit. But NTT's executives are concerned, because: "Demand for telephones has reached the ceiling now. Therefore, the annual increase in revenue has fallen below 4 percent. In spite of this, the annual increase in expenditures is still almost 6 percent. NTT's financial condition has become such that an 80-billion-yen deficit arises every year" (President Shinto).

In order to cope with this situation, NTT must slow down investment. Investments for FY-82 are 1.75 trillion yen, a decrease from the previous year's total for the first time since NTT was founded. Another source of pain is the possibility that after 1983 NTT will not be able to issue the users' bonds now sold on a mandatory basis to telephone customers. This has been a large source of capital. The law

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authorizes users' bonds only for a 15-year period, and the 15 years will expire in 1983. In its FY-82 budget NTT expects to receive over 250 billion yen from users' bonds. If this source of capital is eliminated, the loss will be greater. Moreover, NTT has to pay to the national treasury a total of 480 billion yen, 120 billion yen every year for 4 years, commencing in FY-81. NTT must find a new way to meet this additional demand for funds.

For this reason, NTT changed its policy of raising money through bond issues and for the first time borrowed 10 billion yen from a commercial financing institution last March. This was intended to diversify the sources of supply for funds. At the same time "this was intended to obtain capital at as low an interest cost as possible" (Takeshi Iwashita, the accounting manager). The interest rate for this loan was 0.3-0.4 percent less than the bonds issued at that time. Although late to begin, NTT seems to have started watching all factors in its financial strategy as private companies do. However, since NTT is obliged to deposit surplus funds in the national treasury (at an annual interest rate of 3 percent), NTT cannot manage its funds as it likes. NTT's financial condition seems far from an offensive financial strategy.

As mentioned previously, NTT has numerous problems. Under these circumstances, what moves the organization is after all human resources. President Shinto says: "Stop using NTT language and use Japanese." With this catch phrase, he intends to impress upon all employees the importance of the revolution in consciousness. Can the Shinto Revolution, which aims at activating the organization by adopting the ways of thinking of private enterprise, permeate throughout NTT? Professor Hiroshi Kato of Keio University (the chairman of the Fourth Division of the Provisional Administrative Research Council) noted the following: "NTT should adopt more of the good aspects of private companies. For example, there is no private company in which the president cannot appoint the vice president. On the other hand, NTT's president does not have the power to appoint the vice president. This is a problem as an organization." Meanwhile, the fact is that those who are fascinated by President Shinto's daring way of thinking are predominantly young employees. The solution to this sort of problem seems to be a key to the restoration of NTT.

Seek a Road Toward the Third Sector

NTT is at present in the process of administrative reform. Whether NTT should be converted to a private enterprise or should reform and remain as a public corporation has been under discussion. However, management structures are not limited to a choice between these two. There is another structure of management, the third sector--semigovernmental management. The third sector seems to be the best way to satisfy both conditions of the communications business as a public service and the need for efficiency in management as long as there are no obstacles elsewhere.

Do Not Let a Giant Grow Too Big

Next year NTT will celebrate its 30th anniversary. Over the past 30 years, technology has progressed and society has changed. Given this history, it is rather unusual that nobody has ever questioned why the telephone business has been a government monopoly. Why is the third sector a better alternative? If NTT were

converted to a private enterprise, the adverse effects of bureaucratic work habits insensitive to public needs could be eliminated, but conversion might become an obstacle to the development of the information industry.

If NTT is converted into a private enterprise, the brakes currently imposed on the data communications business will be removed. Then, using its abundant capital, advanced technology, and human resources as a weapon, NTT may overpower other private companies and become a Gulliver-type oligopolistic enterprise. If the concept of INS is realized in the future, NTT will become an organization of incomparable power. The result will be the birth of a giant which controls the brain called computers and nerves called networks in one hand.

Whatever management structure NTT has, its business ought to have limits. Clearly speaking, NTT should, in principle, be in the business of offering communication circuits, and its involvement in the data communications business should be limited to those fields of public interest, such as the Postal Savings online system, and pioneering technologies. The latter, however, must be transferred to private companies when they become capable of handling the technologies.

If NTT evolves beyond a public corporation and enters the third sector, freedom of management increases. Under the present system in which each rate increase must be approved by the Diet, it is hard for NTT to establish a financial base. Of course, even with freedom of management, it is necessary to have a public hearings system, and rate changes must be approved by concerned government agencies. Moreover, under the present system in which NTT cannot raise rates unless its finances fall into deficit, strengthening of NTT's management seems impossible.

Concerning rates, people strongly desire correction of differentials based on distance. On the other hand, NTT is said to face an unavoidable financial deficit in FY-85. How can these pressures be coped with? First of all, shouldn't NTT take measures to lower long-distance rates and raise local rates before it is too late? One condition for doing so should be NTT's adoption of a large zone system that expands the minimum rate call zone to neighboring prefectures. After doing this, it would be justifiable for NTT to raise rates when its finances go into the red.

Step Out into a Freer System

NTT hardly has profitmindedness. NTT makes too little effort to improve its business. For instance, if NTT supports various kinds of telephone consulting businesses and collects fees as an agent, usage of telephones will surely increase. In the case of the minifax service started last September as well, if NTT allows private companies to sell the minifax on a commission basis, the demand for minifax will be developed further. NTT must change its attitude and bad habits of approaching business only on the basis of present technology and fee structures.

The day is near when many companies become internationalized and communication satellites are put into use. Then, what will NTT do about its relationship with Kokusai Denshin Denwa (KDD) [International Telegraph and Telephone--Japan's international telecommunication monopoly]? If business territories cannot be divided, NTT and KDD must consider merging. In order to activate an organization

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and make management efficient, a system free from government budgetary controls, in which wages are independently determined, will be indispensable. NTT ought to move toward a freer system.

Interview With President Shinto

"Content of Communications Services To Be Changed to a Return of Technology to Society"

[Question] NTT has the world's most advanced optical communications technology. NTT's technical capability is certainly great. Does NTT's concept of technological development differ in any basic sense from private companies?

[Answer] They are quite different. In the case of telecommunications, the performance characteristics of equipment are precisely the grade of service. Therefore, priority must be placed on technological development. In this respect, NTT's achievements are great. We have already had technologies prepared for services which will be required 15 years hence. We do not need to buy from others. Those who can say this may be only NTT and AT&T. The question is how efficiently in economic terms we can utilize accumulated technology to serve society and satisfy the public. The aim of management hereafter will be to change the contents to a higher communications service.

[Question] There is a question as to whether or not NTT's technologies are really effectively serving society. Are there any technologies not fully utilized?

[Answer] Yes, a problem concerning technologies exists. In the process of developing technology, we have come up with some technologies that can be very valuable to other industries. However, due to the law governing NTT, we cannot go into areas other than telecommunications. We have many technologies for which we cannot find any use. One example is byproducts produced in the process of developing IC's and glass fibers. Even if the law is revised, it is not good to move into the fields of private companies if NTT is to remain a monopolistic enterprise as it is now. On the other hand, communications equipment is going to be automated in the future and does not require much manpower. If we only sell patents, we cannot support a large family.

[Question] What kinds of influences and effects do you expect open procurement and the cross-licensing of patents with IBM to have on technical development?

[Answer] Until recently we have been dealing with only the so-called NTT family. But with the open door, we are now able to deal with anybody in Japan and the world. In fact, Motorola has become involved. It is good to increase the companies we deal with. It does not affect our technological development at all. The merit of cross-licensing agreements is, in addition to access to patents, to enable our researchers to go into the counterpart's research institutions freely and have discussions with their researchers. If you change one's way of thinking even slightly, the situation sometimes changes dramatically. This helps to increase efficiency in developing technology. The exchange of software helps.

[Question] The other day the All-Japan Telecommunication Workers Union announced its objection to the conversion of NTT to a private enterprise. However, the union also opposes the same salary schedule as other public corporations.

[Answer] Everybody dislikes the phrase "conversion to a private enterprise." The basic principle is to obtain rewards suitable to one's work. Taking telephone charges as an example, we have been reducing rates instead of increasing them. The result of reducing rates is to be criticized as earning too much. Or we are asked to pay surplus funds to the national treasury. This is nonsense. Employees cannot have a life worth living nor work worth working. If salaries must be on the same salary schedule as other public corporations regardless of business results, it would be better to remove the self-supporting account system and merge NTT into the concerned government agency. But, that would not be good, would it?

[graphics]

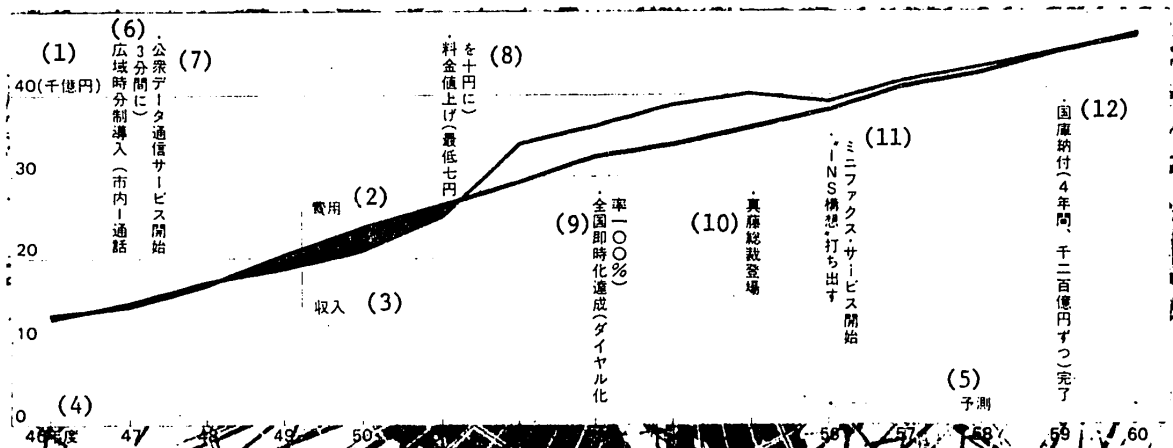


Figure 1. The Trend of NTT's Business Results.

(1) 100 billion yen (2) Expenditures (3) Revenues (4) Fiscal year [showa]
 (5) Forecast (6) Inaugurated the wide-area time system (one local call limited to 3 minutes) (7) Started public data communications service (8) Rate increase (the minimum rate raised from 7 yen to 10 yen) (9) Completed the instant connection system throughout the country (100 percent dialing system) (10) Inauguration of President Shinto (11) Announced the concept of INS. Started minifax service (12) Complete payments to the national treasury (120 billion yen a year for 4 years)

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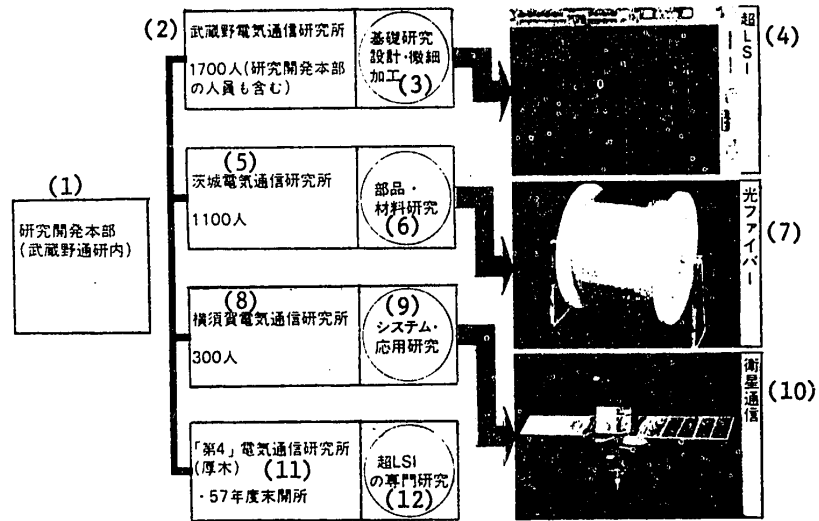
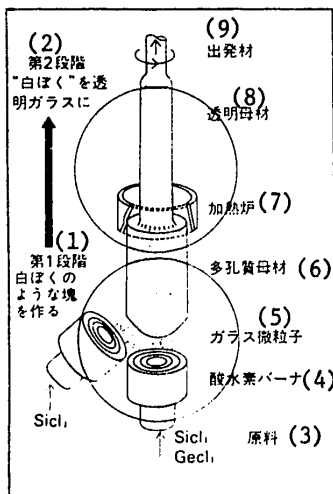


Figure 2. 3,100 Researchers in Charge of Advanced Technologies (NTT's Research System).

(1) Research and Development Headquarters in the Musashino Electrical Communications Laboratory) (2) Musashino Electrical Communications Laboratory, 1,700 researchers (including personnel of the Research and Development Headquarters) (3) Basic research, design, and microprocessing (4) VLSI (5) Ibaragi Electrical Communications Laboratory, 1,100 researchers (6) Research on parts and materials (7) Optical fiber (8) Yokosuka Electrical Communications Laboratory, 300 researchers (9) Research on systems and applications (10) Communications satellites (11) The Fourth Electrical Communication Laboratory (in Atsugi) expected to open at the end of FY-82 (12) Specialized research on VLSI

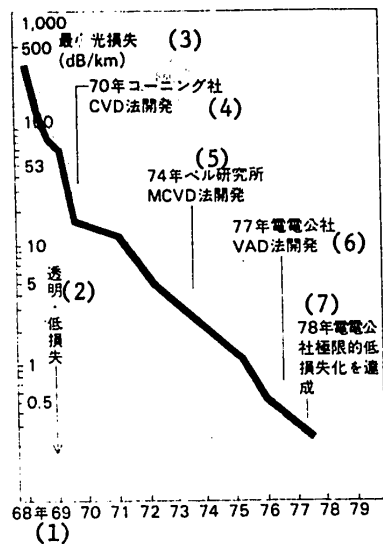
Figure 3. Manufacture of Optical Fiber by the NTT-Developed VAD Method (in Part).



- (1) First stage: produce a chalk-like mass.
- (2) Second stage: make "chalk" transparent.
- (3) Raw Material
- (4) Oxyhydrogen burner
- (5) Minute particles of glass
- (6) Porous basic material
- (7) Heating furnace
- (8) Transparent basic material
- (9) Starting material

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Figure 4. NTT's Optical Fiber, the Best in the World.



- (1) Year
- (2) Transparency, low loss
- (3) Minimal loss of laser beam
- (4) Corning developed the CVD method in 1970.
- (5) Bell Laboratories developed the MCVD method in 1974.
- (6) NTT developed the VAD method in 1977.
- (7) NTT achieved the lowest possible loss in 1978.

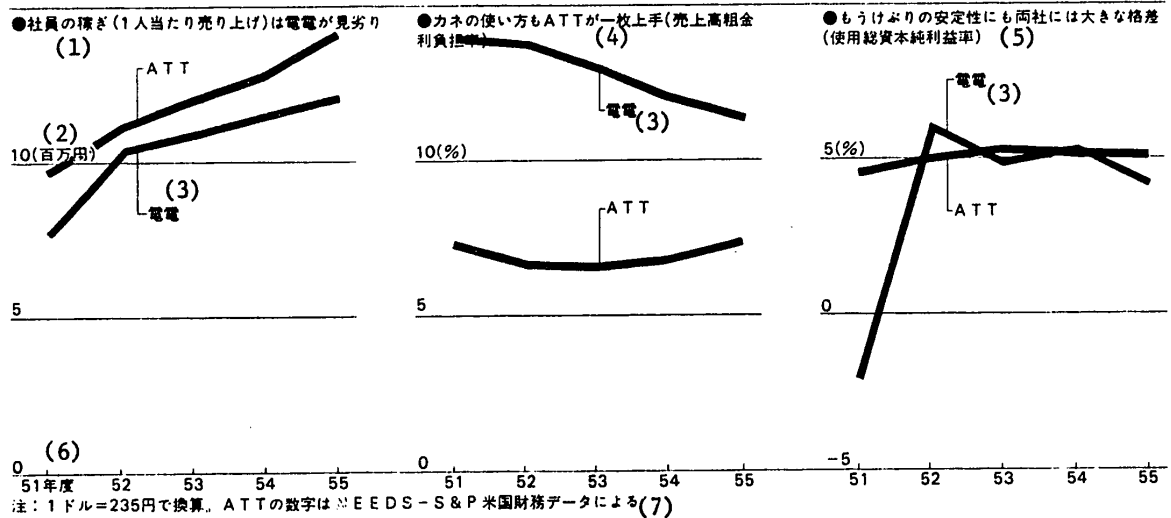


Figure 5. Comparison of Management Indicators between NTT and AT&T.

- (1) NTT is inferior in earnings per employee (sales per employee).
- (2) Million yen
- (3) NTT
- (4) AT&T is also better at using money (gross interest burden as a percentage of sales).
- (5) There is a big difference in earnings stability between the two (ratio of net profit as a percentage of employed gross capital).
- (6) Fiscal year [showa]
- (7) Note: The exchange rate is 235 yen per 1 dollar. AT&T's figures are quoted from the U.S. Financial Data by Needs--Standard and Poor.

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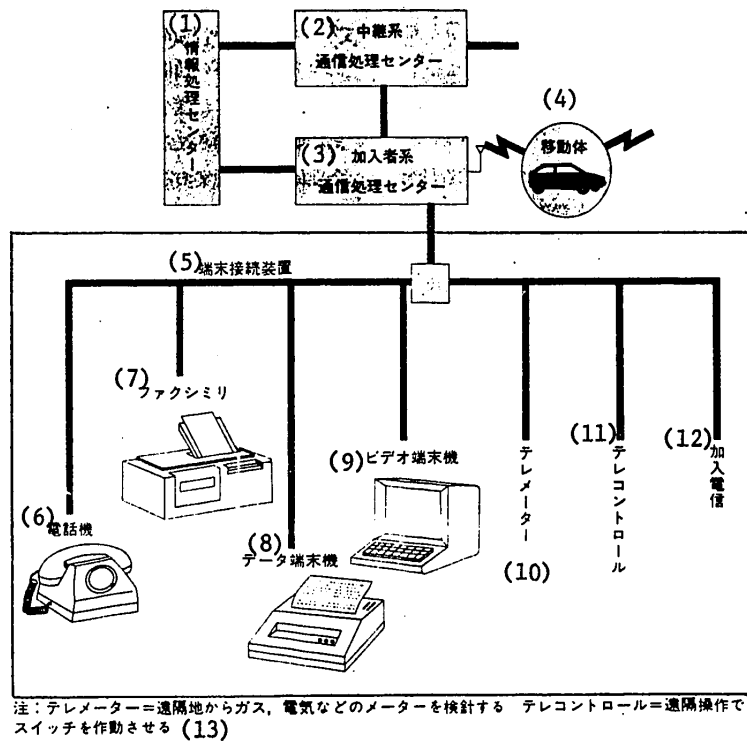


Figure 6. NTT's Concept of INS.

- (1) Information processing center
- (2) Communications processing center for relay
- (3) Communications processing for customers
- (4) Mobile units
- (5) Terminal connection device
- (6) Telephone set
- (7) Facsimile
- (8) Data terminal
- (9) Video terminal
- (10) Telemeter
- (11) Telecontrol
- (12) Telex
- (13) Note: Telemeters read gas and electric meters from a distant place. Telecontrols operate switches by remote control.

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SCIENCE AND TECHNOLOGY

EXPORT OF NATIONALLY OWNED PATENTS TO U.S. UNDER STUDY

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 9 Dec 81 p 1

[Text] New Technology Development Association To Seriously Consider Technology Export; In Cooperation With Mitsubishi Corp, Exports of Japan's Nationally Owned Patents To Resolve Economic Frictions

Reportedly, the New Technology Development Association (chairman Yoshimitsu Takeyasu) and Mitsubishi Corporation (president, Yohei Mimura) have reached basic agreement to jointly export Japan's nationally owned patents to the United States. A memorandum will be officially signed between the two parties by next week at the latest. The purpose of this agreement is to convey the association's plans to promote technology transfer to the United States by exporting research results of advanced technologies developed by Japanese universities and national research agencies, fully taking advantage of Mitsubishi's extensive information network in the United States. This is the first attempt by the association, a Japanese Government organization, to consistently engage in full-scale technology export. Although Japan's technology exports to the advanced Western countries have shown a gradual rise, both the number and the amount of exports are still small compared to those of technology imports. If this operation runs smoothly, it is expected that it will not only improve technology trade but also help in resolving economic friction between the United States and Japan.

The New Technology Development Association is a corporation having special status under the Science and Technology Agency. It plays a role as a mediator between universities and national research agencies, on one hand, and enterprises, on the other, by entrusting the latter with the research results of the former so as to realize commercialization potential. In the past 20 years since its establishment, the association has handled approximately 350 cases of commissioned development and technology mediation which led to commercialization. However, there is hardly any record of technology transfer to foreign countries, except one, to the United States, on option contract terms, concerning "technology in glucose isomerization by the enzyme methods," from the National Food Research Institute of the Ministry of Agriculture and Forestry.

Mitsubishi Corporation, on the other hand, has a technology knowhow team within its headquarters Business Planning Room and has been emphasizing the area of technology trade through importing advanced technologies to Japan under the

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domestic sole agent contract with the U.S. Bachtel Research Institute, the world renowned agency for sales and mediation of technology. Recently, Mitsubishi exported the technology of the Japanese National Railways.

With these in the background, the New Technology Development Association has decided to cooperate with Mitsubishi by engaging in both domestic and overseas operation of technology transfer. The specific contents of the cooperation have not been disclosed, but it is known that: 1) the New Technology Development Association will commission Mitsubishi Corporation to conduct marketing research in the United States for potential clients; 2) the association will select prominent advanced technologies and request Mitsubishi to introduce recipient U.S. enterprises; 3) Mitsubishi will fully take advantage of the branch office networks of its U.S. corporation, Mitsubishi International Corporation, and conduct marketing research for potential clients. It will receive some percentage of the patent fee when a contract on technology transfer takes place. However, the association is responsible for making the official contract.

The association will select technologies among those which: 1) have foreign patents, 2) have been completed and have some achievements in Japan, and 3) those for which permission from inventors and enterprises has been obtained. For the time being, examination are underway regarding "oxidized membrane production technology by ion plating," "weak electrode chemical luminescence detecting technology," "method for manufacturing short metallic fiber," "flowing material for artificial kidney dialysis," and "a method for synthesizing sexual pheromones."

Although Japan's balance of technology trade is said to be improving, the number of technology imports is about 2,000 cases in FY-80 and the amount paid is 1.439 billion yen, while the amount received for exports is as low as 378 million yen. Since Japan aims at being a technology-based nation, it is considered that the promotion of technology exports in the future will also serve to resolve economic frictions with the United States.

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SCIENCE AND TECHNOLOGY

TOSHIBA ELECTRON BEAM LITHOGRAPHY FOR LSI MASS PRODUCTION

Tokyo KIKAI SHINKO in Japanese Vol 14 No 12, Dec 81 pp 75-83

[Article by Toshiba Corporation President Shoichi Saba; Kinichi Noga, inspector; Yoshiyuki Takeishi, deputy director, Comprehensive Research Institute; Yushi Matsumoto, chief, IC Research Center, Comprehensive Research Institute; Hachie Koike, chief, Machine Tool Division, Toshiba Machine; Akira Naito, chief, EBM Production, Toshiba Machine]

[Text] Preface

Electron beam pattern lithography has become essential for development and manufacture of LSI and super LSI replacing the conventional photoetching. The system concerned is an electron beam lithography system which has been put on the production line for the first time in Japan to manufacture master masks and reticles after various improvements and developments corresponding to the needs of the actual semiconductor manufacturing plants, based upon the research results obtained by the Super LSI Technology Research Association. Along with the system, applicational software and the photoresist process necessary for practical use of the system have been developed, which facilitated the completion of an excellent system that can be operated freely on the production line.

The system has already been introduced in several places and is taking an active part in development and production. In view of the fact that the majority of semiconductor manufacturing equipment is imported, it is highly significant that an excellent system has been completed for use in production through domestic technology. The point of the development was concentrated on constructing a well-balanced stable system with the highest technologies currently available at hand.

This system is equipped for the first time in the world with a function to produce reticles necessary for wafer steppers, which have spread dramatically in recent years. In addition, an inexpensive machine that is furnished singly with this function has been also completed, and it is being introduced to the production line by popular demand.

Development and Background

Conventionally, LSI circuit patterns are made from a set of master masks, each produced first by feeding designed pattern data to a pattern generator (PG),

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which generates a reticle 10 times larger than the final size and by photographically reducing and reproducing the image of the reticle by a "step-and-repeat" process (Figure 1). In this method, the LSI is highly integrated and the following problems are known to be associated with the reduction in dimensions of the patterns.

- a. Due to the limit of optical resolution, forming of fine patterns is not possible.
- b. In complex patterns, PG takes too long to generate a reticle to be really practical.
- c. The power of the step-and-repeat camera makes it difficult to form LSI patterns over 10 x 10mm in size.

At Toshiba Corporation, a team primarily composed of the members of the General Research Institute started to develop a utility model and completed a prototype in 1976. Subsequently, the company contracted a project to develop and produce a trial model of the VL-R1 machine, which adopted a similar lithographic system from the Super LSI Technology Research Association, and completed it in 1977.

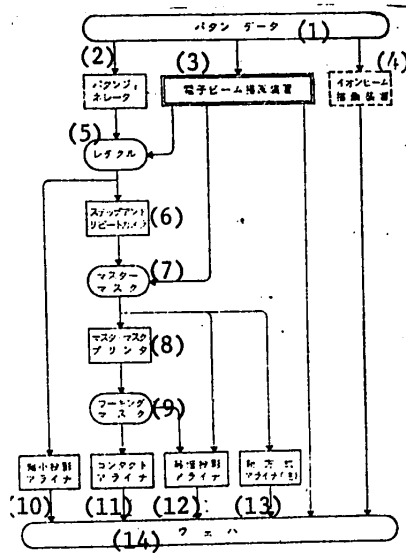
In parallel to this work, Toshiba Machine Co planned to merchandise this system using technology provided by Toshiba, and promoted the development in cooperation with the above described Toshiba team. Starting around this time, serious discussions concerning the practical application of electron beam lithography on the production line had begun to develop and many questions were raised regarding the function, operability, stability, maintainability and costs.

Those in charge of the project from both companies were united in an effort to answer these questions and devoted themselves to improvement and development of a utility model. In 1978, the first model was completed and activated for actual operation. In parallel, improvement of electron beam resist and its process and development of the mask process such as Cr film etching, all necessary for the practical application of this system, were completed. Eventually, we started to offer the system to users.

System Outline

This system forms a large family, including the EMB-105B for mask and reticle etching, the 130/40 for 6-inch substrate high-speed etching and the 105R B for reticle etching only. However, in the following, the 105B model will be described as representative of the rest.

Figure 2 and Figure 3 show the arrangement and etching method of this system. Etching data is read from magnetic tapes and stored in magnetic disks using an EBM format original to this system. This data is pulled out during etching, developed into dot data through a unique circuit shown in Figure 4 and transmitted to an electron irradiation system blanking electrode.



(Note) Location in LSI lithography of electron beam lithography system utilizing ultraviolet ray, x-ray and electron beam (photocathode transference, reduction projection)

Figure 1. Location of Electron Beam Lithography System in LSI Lithography

- Key:
- | | |
|--------------------------------------|--|
| (1) pattern data | (8) master mask printer |
| (2) pattern generator | (9) working mask |
| (3) electron beam lithography system | (10) reduction projection aligner |
| (4) ion beam lithography system | (11) contact aligner |
| (5) reticle | (12) equi-magnification projection aligner |
| (6) step and repeat camera | (13) new method aligner (note) |
| (7) master mask | (14) wafer |

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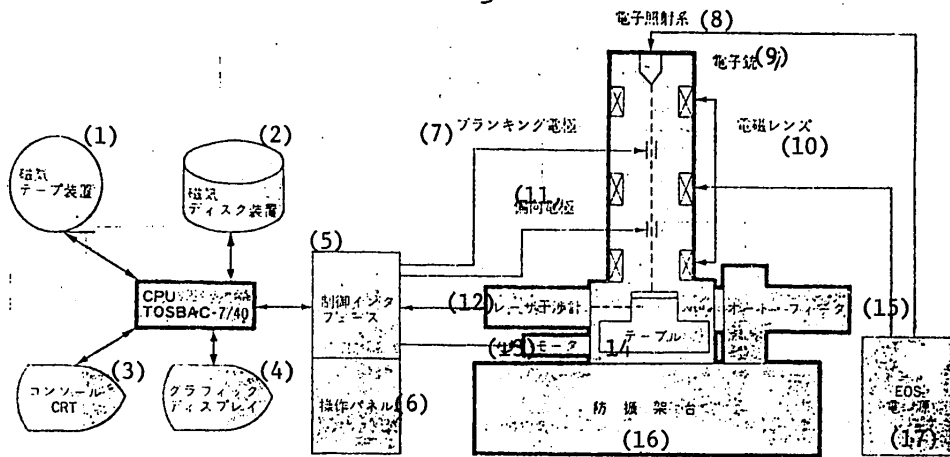


Figure 2. System Arrangement

- Key:
- (1) magnetic tape
 - (2) magnetic disk
 - (3) console
 - (4) graphic display
 - (5) control interface
 - (6) operation panel
 - (7) blanking electrode
 - (8) electron irradiation system
 - (9) electron gun
 - (10) electromagnetic lens
 - (11) deflection electrode
 - (12) laser interference meter
 - (13) motor
 - (14) table
 - (15) auto feeder
 - (16) oscillation proof pedestal
 - (17) power source

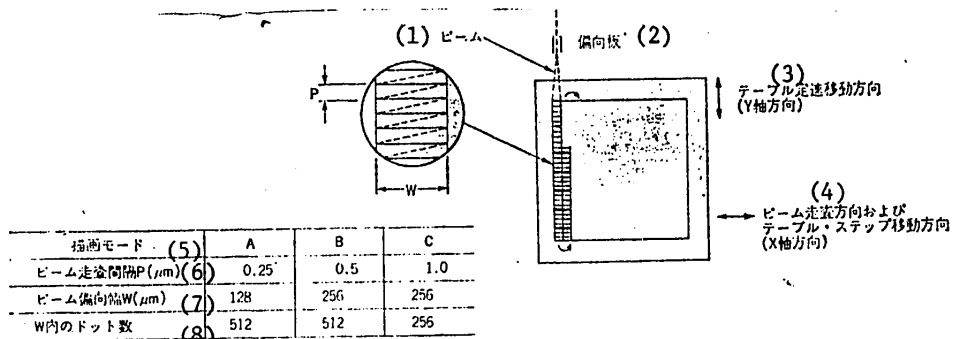


Figure 3. Explanation of Etching Method

- Key:
- (1) beam
 - (2) deflection plate
 - (3) traveling direction of table at a steady speed (Y axial direction)
 - (4) beam scanning direction and table step traveling direction (X axial direction)
 - (5) etching mode
 - (6) beam scanning span
 - (7) beam deflection width
 - (8) number of dots within 4

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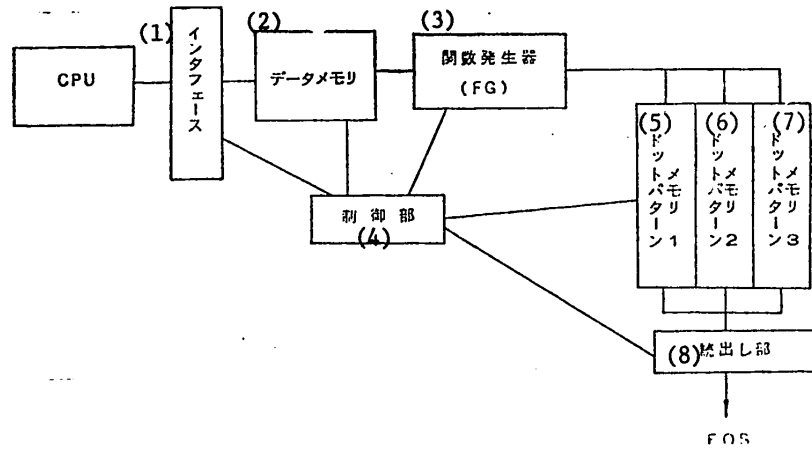


Figure 4. Pattern Generation Etching Circuit

Key:

- | | |
|------------------------|--------------------------|
| (1) interface | (5) dot pattern memory 1 |
| (2) data memory | (6) dot pattern memory 2 |
| (3) function generator | (7) dot pattern memory 3 |
| (4) control | (8) read out |

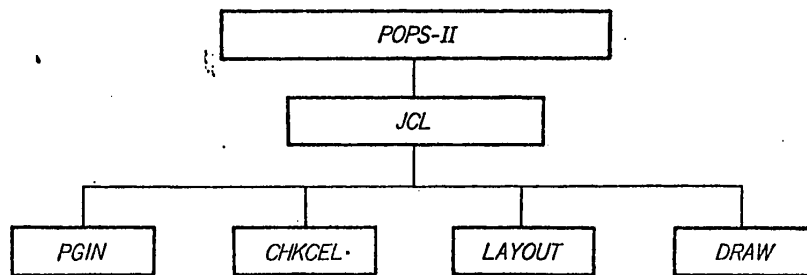


Figure 5. Arrangement of Software

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Etching is produced by a so-called continuous traveling raster scan, a combination of linear deflection of the X axial electron beam and Y axial reciprocating motion of the substrate. Data transmission, linear deflection start and the relative position correction of the electron beam and the substrate are controlled by the signals of the laser interference meter.

The system has three etching modes, as shown in Figure 3. Automatic irradiation and deflection system adjustment functions are provided so that the system can speedily accommodate the changes of the etching conditions. An autofeeder stores substrates up to 10 sheets and automatically loads and changes substrates on the table.

Data processing and etching are operated and controlled by a minicomputer TOSEAC-7/40. The principal arrangement of the software is shown in Figure 5. POPS-II is adopted for OS because of the merit of its multiprogramming process. Other software includes: JCL for selection of jobs, PGIN for pattern data processing, CHKCE for pattern data change inspection, LAYOUT for lining chips on substrates, and DRAW for operation and control of etching. Various applicational programs are also available besides these. The external appearance and functions-of the software are shown in Photo 1 and Table 1 respectively.

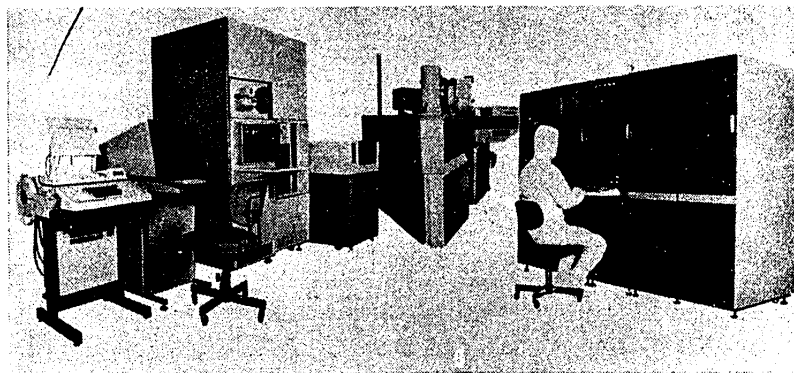


Photo 1. Electron Beam Reticule Etching System

Table 1.

● Main Body	<u>EBM-105B</u>	<u>EBM-130</u>
Height of the main body	2,200mm	2,200mm
Magazine loading height	940mm	1,000mm
Floor area of the main body	1,600mm x 1,450mm	1,600mm x 1,500mm
Gross weight of the main body	3,200kgf	3,500kgf

Table 1 [continued]

• Vacuum Exhaust System

For autofeeder and general rough suction For electron gun, body tube etching chamber	turbo molecular pump ion pump
---	----------------------------------

• Various Functions

(Other optional functions are available)

Pattern capacity (converted in number of PG flash)	Reticles, approximately 5 million, several times more than mask reticles
Pattern data monochromatic inversion function	
Pattern data window function	
Pattern data resize function	Possible when changing data
Pattern data mirror function	
Pattern data rotation function	Possible at every 90°C
Pattern data check function	Vector mode and dot mode
Alignment of chips	Randon alignment, standard angle/round alignment
Alignment of different chips	Chips of same dimensions, chips of different dimensions (when considered as chips of the same dimensions, there will be no decline of the throughput)
Multipattern function	Multireticle pattern/substrate
Target mark, key mark insertion function	DSW-4800 (GCA), NSR-1010 (NIKON) and others, for various machine models
Operation memory output function	
Scaling function	Option 0-10 when changing data, A mode 0.8 - X1.2 and B and C modes X0.7-X1.2 when etching

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Table 1 [continued]

● Electron Irradiation System

Electron gun emitter	boride lantern
Acceleration voltage	20 kV
Electron beam diameter	0.2 1.2 μm
Maximum exposure	A/B/C mode 8/8/16 C/cm ²
Image detector	reflected electron detector
Automatic setting function	electron irradiation system, deflection system

● Autofeeder

Cassette	one/substrate/cassette (all sizes)
Magazine	10 cassettes/magazine
Running mode	continuous or individual sheet

● Pattern Dimensions and Accuracy by Mode

Etching mode	Minimum line width	Line Width Increase	Pattern Accuracy	Pattern Accuracy Among Masks	Scanning Width
A	1	0.25	±0.12	0.2	128
B	2	0.5	±0.14	0.3	256
C	4	1.0	±0.20	0.4	256

● Throughput

Etching mode	Etching range (minute)			
	50x50	75x75	100x100	130x130
A	56	118	203	334
B	17	33	56	90
C	11	20	32	50

● Additional Functions

Number	Function	Outline
1	Chip merge function	make one chip data by joining two chip data
2	Mask merge function	make one mask data by joining two mask data
3	C A L M A I N	transform GDS format data of CALMA to EBM format and register it in disk file
4	B E L L I N	transform BELL format data to EBM format and register it in disk file
5	PGIN (inch system)	transform inch system PG data to EBM format and register it in disk file
6	Data check function	dump EBM format data in chip file

Technological Features

The technological features can be summarized in the following eight items.

1. Etching Method

By the development of the pattern generation etching circuit shown in Figure 4, graphic data expressed by trapezoids can be transformed to dot patterns at a high speed and etched sequentially in a band from one end to the other within the etching range as seen in Figure 3. The practical effect of this invention is immense, as will be described later.

2. Data Processing

In this type of system, graphic data is transformed in advance into dot pattern data corresponding to the beam diameter before etching. The following improvements were added to this process in this system.

a. Development of algorithm that dissolves quantize errors associated with the data transformation to a practically harmless level.

b. Compacting of data volume by dividing circuit diagrams into trapezoids and expressing them in instruction word format. By adding this graphic data to the previously described etching circuit, it can be transformed into dot patterns in real time in parallel with etching, which has realized the shortening of data transformation time, and the restriction and elimination of graphic etching.

c. The shortening of data transformation time was realized by developing a merge function where a circuit diagram is systematically divided into blocks, data-transformed and subsequently reunited.

3. Highly Accurate Sample Table

It is required that accuracy be maintained in a vacuum--for instance, up and down movement--below $2\mu\text{m}$ from the point of pattern accuracy and stable accuracy relative to traveling several hundred km from the point of continuous running. Also, from the point of accuracy of the position of the electron beam, the table is composed of nonmagnetic materials and requires correction relative to temperature changes. In order to meet these requirements, numerous investigations and elaborate tests were conducted regarding structures, materials, lubrication and manufacturing methods to complete this table. Incidentally, this table received the Okoshi Memorial Award for 1980 from the Precision Machine Society.

4. High Luminance Long Life Electron Gun

For the first time in the world, a single crystal LaB_6 cathode was built in an electron gun and adopted. With this new idea, beam current density and life was improved more than 10 times compared to the conventional tungsten cathode. The points that contributed to making the new cathode practical

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were determination of the optimal azimuth of the crystal axis, clarification of crystalline properties and correlation between the quantity of impurities and the characteristics, and establishment of an optimal grid bias value and cathode temperature.

5. Highly Efficient Electron Irradiation System

The electron irradiation system was developed in line with the optimal table traveling speed, deflection width and beam current in relation to the required etching speed. In other words, deflection angle was reduced and deflection distortion was minimized by designing a shorter focal length, which increased beam current and focal depth and curtailed disturbance to beam position.

6. Software

Besides the basic arrangement shown in Figure 5, the software is complete with programs which correspond to various functions shown in Table 1. Other programs available are for intermediate format input-output, ID letter input, disk and magnetic tape file management and recording of operational conditions.

7. System Expandability

The following optional functions are available and can be added to the basic structure: expansion model which processes etching and data transformation in parallel using an additional data transformation specialty calculator system independent of the etching control; wafer direct etching; double speed etching.

8. Self-Diagnostic Function

Etching accuracy automatic diagnostic function, sample table dynamic characteristic analytic function and etching circuit diagnostic function are furnished to insure proper management and maintenance through prescheduled regular inspection and diagnosis. Fail-safe measures are provided besides these functions for each module by means of failure diagnoses and various interlocks.

Practical Features

1. The system has made it possible to shorten drastically the turnaround time of LSI development. Etching speed in PG is about 200 flash/min. Recent LSI requires a total flash number of as many as some hundred thousands and takes some tens of hours for etching. However, the etching time by this system is less than 30 minutes.
2. It is equipped with an inexpensive 105R B model special machine for etching reticles necessary for the use of wafer steppers, which have been very popular imports in recent years. This machine is characterized by extremely high cost performance; nothing comparable to this product exists.
3. As the beam current density is 10 times greater than other systems, positive resist with stable characteristics such as PMMA can be used.

4. Because of a long cathode life, the system is not stopped as frequently as others for replacement of the cathode.
5. Monochromatic inversion of pattern data can be achieved easily, and only one variety of resist and process are needed on hand. Also, monochromatic inversion does not affect the etching time.
6. Etching time is determined not by the complexity of the patterns but only by the etching mode and etching area. Consequently, it is easier to project a production plan for etching.
7. Many kinds of chip patterns can be etched in one sheet of substrate without slowing the etching speed. (Figure 6)
8. With one application, a chip is etched up to the maximum 105 x 105mm in a 105 size and to the maximum 130 x 130mm in a 130 size.
9. Multiple reticles can be generated on the same substrate. When LSI of small chip size is fabricated by a wafer stepper, the throughput will increase by several times (Photo 2).
10. When etching, the scaling ratio can be changed for every line of chips.
11. A substrate autofeed function is provided to make it possible to etch up to 10 sheets.
12. Because of the automatic setting function provided for the electron irradiation deflection system, changing of scaling and etching mode and establishing and changing of minute beam diameter and current are simple.
13. Vibration proof and thermostatic equipment incidental to the installation of this system can be of a simple design so long as it does the job.
14. The system runs stably and demonstrates an operating ratio of over 94 percent and a production yield of over 90 percent.

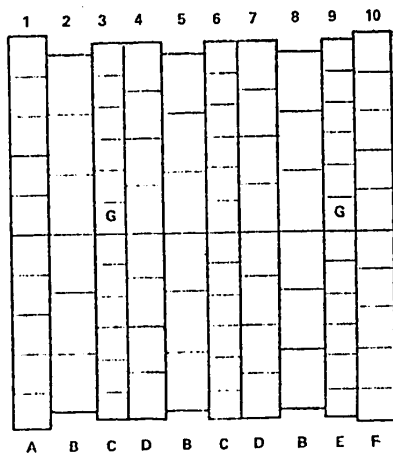


Figure 6. Various Chip Patterns

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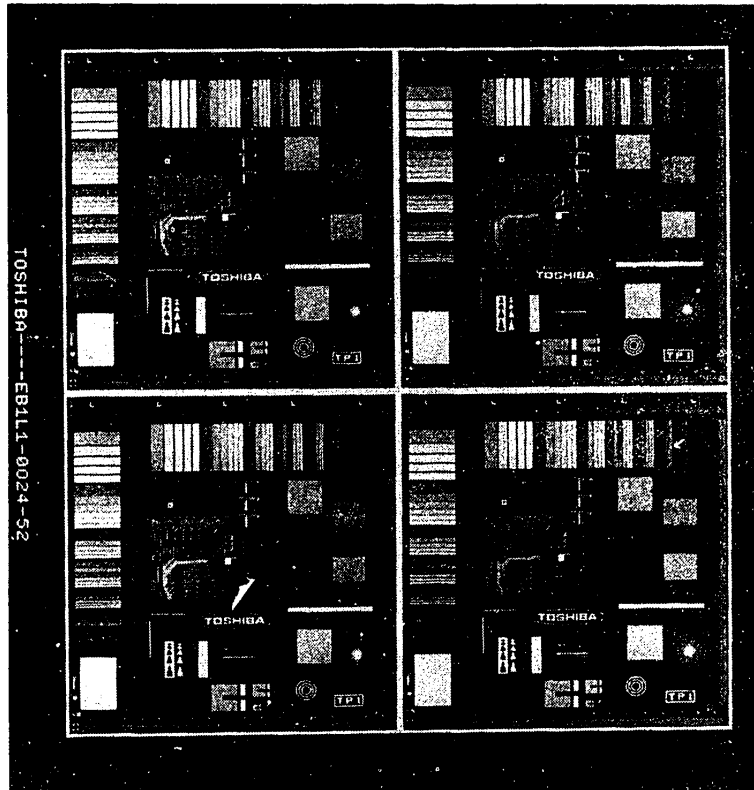


Photo 2. Multiple Reticles

Status of Industrial Property Rights

Among the patents (including utility model) applied pertaining to the system under discussion, 109 cases were opened to the public, 9 cases are being officially announced as patents, 12 cases were registered and 5 cases were registered as American patents.

Registration Number

Title of Invention

No 888406 (Patent announcement Sho52-14055)	Function generator in raster display system
No 900143 (Patent announcement Sho52-28529)	Graphic display system
No 967337 (Patent announcement Sho54-1433)	Exposure system
No 981699 (Patent announcement Sho54-16192)	Exposure accuracy measuring method for electron beam exposure apparatus

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No 982551 (Patent announcement Sho54-13754)	Electron beam exposure apparatus
No 982552 (Patent announcement Sho54-13755)	Electron beam exposure apparatus
No 992785 (Patent announcement Sho54-24831)	Electron beam exposure apparatus
No 992786 (Patent announcement Sho54-24832)	Electron beam exposure apparatus
No 994579 (Patent announcement Sho54-28270)	Electron beam exposure apparatus
No 1006054 (Patent announcement Sho54-39710)	Electron beam exposure alignment mark forming method
No 1008771 (Patent announcement Sho54-42588)	Electron beam deflection circuit
No 1027640 (Patent announcement Sho54-13353)	Electron beam exposure apparatus
USP-4063103	Electron beam exposure apparatus
USP-4145615	Electron beam exposure apparatus
USP-4151417	Electron beam exposure apparatus
USP-4151421	Method for compressing pattern data and compression processing circuit for radiant beam exposure apparatus
USP-4158140	Electron beam exposure apparatus

Conclusion

Fabrication of circuit diagrams is one of the basics of semiconductor technology. The system under discussion has improved the fabrication in accuracy, miniaturization, speed and flexibility on the basis that data processing and etching take place in parallel. With these features, it can be said that the system directly contributes to the speedup of the super LSI era and the progress of the super LSI technology.

Likewise, it has generally become an established theory that mass production LSI patterns will be generated on wafers by a projection aligner in the 1980's. The mask and reticle production necessary for this process is expected to be fully accommodated by the family of this system. In particular, it is regarded as an optimal pairing from the aspects of functions and costs to produce reticles by the special reticle etching machine 105R B model for the reduction projection aligner, which is considered to be in the mainstream of the future.

However, it seems necessary to have a new system, including super-high-speed wafer direct etching by electron beam, for non-mass production LSI which is expected to encounter increased need in the future and for LSI in the 1990's. We are determined to continue our technological development efforts to meet these demands.

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