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NEW TECHNOLOGIES AND THEIR USES

Over the next decade exciting prospects exist for providing low-cost, reliable communications links spanning thousands of miles of land and water and reaching into many of today's remotest areas. Under the impact of continuing technological advance, geographical distance *per se* will become a progressively less important factor, being far out-weighed by the more prosaic considerations of terminal switching, local landline hookups,and administration. The vast potential benefits to society have already received much publicity and attention.

Developments in the field of satellite communications are especially noteworthy. Under auspices of the International Telecommunications Consortium (INTELSAT) several satellites have been launched to provide telephone and teletypewriter service, and occasional television relay, across the Atlantic and Pacific. The INTELSAT Early Bird

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satellite orbited over the Atlantic in 1965, although officially an experimental project, already provides commercial service at lease rates roughly comparable to those of existing cable facilities. Within three or four years the consortium may orbit a satellite offering 100 times the channel-years (number of years of expected useful satellite life multiplied by channel capacity), but at a total cost no more than two or three times that of Early Bird. For the 1970's, even more advanced designs are in the talking stage.

The U.S. Department of Defense has underway an "Initial Defense Communications Satellite Program" to provide long-distance links of modest capacity serving special military needs. An advanced system with greater capacity is planned for use by 1970; a tactical system to provide communications between combat and other field units is in an earlier stage of development.[1]

The Soviet Union is moving rapidly ahead. Among other applications, telephone and television service via satellite is available between Moscow and Vladivostok. A consortium including the Soviet Union and Eastern European countries is to exploit further this new technology.

The French government is engaged not only in space vehicle development, but also in constructing an elaborate launching site near the equator in French Guiana -- a location particularly attractive for boosting satellites into equatorial orbit. France and West Germany have recently announced plans to launch a joint communications

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[1]U.S. military systems are discussed in Committee on Government Operations, Forty-Third Report, Government Use of Satellite Communications, 1966.

satellite from this site in late 1970.[1]

Major advances are also being made in other communications techniques. High-capacity underwater cables, employing transitor repeaters as a substitute for vacuum tubes, can be installed at a fraction of the cost per telephone channel embodied in the existing transoceanic cables. Laboratory experiments with laser beams are well underway. In the more distant future, perfection of laser-beam "pipelines" would provide a truly enormous increase in telecommunications capacity.[2]

Use of these technologies for telephone, teletypewriter, and data traffic is both obvious and fairly straightforward. Two other applications -- television service and facsimile mail transmission -- are also potentially important, both in terms of commercial markets and implications for national security. But they involve special considerations that merit separate discussion.

Television and Facsimile Mail

The feasibility of instantaneous worldwide dissemination of television programming via satellite was dramatically shown as early as 1962 in the experiments across the Atlantic with the Telstar Satellite. Since existing transoceanic cables simply do not have

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[1] A summary of the current status and plans of INTELSAT is contained in Communications Satellite Corporation (Manager for INTELSAT), Report to the President and the Congress, Washington, D. C., 1966. For a brief account of French activities, see Aviation Week and Space Technology, June 20, 1966, pp. 209-211 and June 5, 1967, pp. 22-25.

[2] For a more detailed recent survey of these and other possibilities see "Communications, Searching Eye, Questing Ear," Forbes, July 15, 1967.

the broadband capability to carry conventional television channels, the wholly new possibilities have attracted widespread attention. Transatlantic service is today routinely available, and special-event programs are relayed from time to time across both the Atlantic and the Pacific. With continued technological advance, not only will transoceanic service become progressively less expensive, but satellites will become serious competitors of existing terrestrial facilities for domestic use as well. For the United States, recent studies disclose that distribution of programming from network centers to outlying land broadcasting stations via satellite relay would be less costly to the commercial networks than the landline microwave facilities they now employ.[1]

To be sure, the value of instantaneous transmission is reduced because of time zone differences around the world, and requirements for local editing. Even in the continental United States, crossing only four time zones, it is generally necessary to delay broadcasting to local home receivers for the convenience of the viewer. Employing a satellite over the Atlantic or the Pacific requires in almost all cases that the program be taped at the receiving end for local rebroadcast at a more convenient time.

In view of these delays, would not shipment of videotape by airmail be highly competitive with satellites, especially in the era

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[1]Much of the evidence regarding use within the United States is contained in responses to an inquiry of the Federal Communications Commission, Docket 16495. See especially the Ford Foundation, Response to the FCC Inquiry; American Telephone and Telegraph Co., An Integrated Space/Earth Communications System to Serve the U.S.; Communications Satellite Corporation, Technical Submission of the Communications Satellite Corporation, all December 1966.

of supersonic transport? In cases where programming is to be sent between two points, say New York and London where nonstop airline service is frequent, the satellite would indeed have little to offer. But to concentrate on such instances is to miss the point -- the real potential of satellites lies in their flexibility in picking up programs in both central and out of the way places and distributing them simultaneously to ground stations around the world: A revolt in the Congo covered on the spot by television crews with an airlifted portable satellite transmitter station to relay material via satellite to dozens or hundreds of receiving stations in Europe, North America, South America and Asia; an urban riot in the United States likewise flashed around the world; an emergency United Nations session in New York transmitted as it is taking place, not just across the Atlantic to a few capital cities, but to every point north, east, west and south where a receiving station is available. The fact that the distant viewer sees the program with some hours delay turns out to be trivial. The timeliness and the liveliness of the presentation to viewers around the world made possible by satellite cannot be approached by any other now-known means of distribution.

Analogous to the case of airmailed videotape, it is the element of flexibility that gives the satellite an advantage over the recently perfected transistorized underseas cable mentioned on page 3. These cables also have a capability to transmit television programs (unlike existing transatlantic and transpacific cables); if we were concerned only with communication across the Atlantic between two major points, such cable might involve no higher a cost than satellite.

But a satellite together with a group of ground terminals scattered in countries on both sides of the Atlantic would provide a whole network of links. And more than that, the capacity over each link could be adjusted (within limits) to conform to peak daily traffic demands over that link. Plans are well advanced to establish a transistorized cable stretching 1250 miles from Florida to the Virgin Islands, and there is talk of yet other cables in the Caribbean and on other high-density routes. These cables will, of course, contribute importantly to satisfying regional needs and they will add a further desirable element of diversity to the physical structure of worldwide communications. But viewing current problems and prospects as they now stand, I conjecture that the thrust of the future will not run in the direction of extensive cable construction.

In a facsimile mail transmission system high-priority correspondence -- technically limited only to any written or pictorial information expressed on paper -- is scanned electronically at the point of origin, the information transmitted via landline or satellite relay to another point perhaps thousands of miles away, and then reproduced at the other end on a facsimile machine in essentially the original form. Reduction in the cost and complexity of facsimile reproducers, combined with growth of satellite systems, will very probably make this economically feasible during the 1970's. Instantaneous or overnight delivery to any point in the world included in the network would be highly attractive for firms operating internationally, individuals with friends and family and family overseas, and governments with each other and with their own foreign staffs.

THREE QUALIFICATIONS

One's imagination can be nearly carried away in considering the prospects for drastically reducing the costs of communication, opening up new rich markets, and reducing or eliminating geographical distance as a barrier to human interaction. But we must remember that these are prospects, not today's reality; while the promise is great it would be a disservice not to mention three major qualifications, before passing on to implications for national security.

Public Policy

First, the most serious difficulties and constraints in moving ahead may hinge not only on questions of technical and economic feasibility, but also on questions of how uses of new technologies are to be promoted, restricted, and regulated as a reflection of conscious choices and judgments about what constitutes the "public interest" and how it ought to be served. The presence of large-scale cost reductions afforded by a new technology does not necessarily mean that users will reap the benefits as fully or as quickly as one might expect on the basis of comparative cost analysis alone. For the introduction of a new technology frequently gives rise to a host of issues regarding ownership and management, criteria for setting prices and conditions of access to users, and the degree to which use of the technology is to be restricted or prohibited to protect existing investment in earlier, obsolescent facilities.

In the United States these issues have been at the forefront during the emergence of satellite technology. Questions about who should own and operate satellite systems have been the subject of extended controversy. Only after long and bitter congressional debate was legislation passed authorizing a new entity -- the Communications Satellite Corporation (Comsat) -- as the U. S. representative to establish in cooperation with other countries a global communications satellite system. Subsequently, argument has centered around a number of issues including the degree to which Comsat should be permitted to compete with existing U.S. telephone and telegraph common carriers.[1]

The issue of competition came out clearly in the recent so-called "30-channels" case. In the summer of 1966 the Department of Defense negotiated to lease directly from Comsat 30 satellite channels from Hawaii to the Far East. Comsat's quoted a rate of $4,200 per channel per month, in contrast to $10,000 to $12,000 quoted by several of the common carriers in conformity with their then-existing rate structure for transoceanic cable. However, the Federal Communications Commission ruled that Comsat was not, in general, to offer services directly to the ultimate user -- not even to the U.S. government. According to the FCC, the role of Comsat was to be that of a middleman leasing satellite channels to the common carriers, with the carriers in turn "retailing" them to the ultimate user. After extended debate, the

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[1] An excellent analysis of major current issues relating to Comsat is presented by Herman Schwartz, "Comsat, the Carriers, and the Earth Stations: Some Problems with Melding Variagated Interests," Yale Law Journal, January 1967. The issue of ownership and operation of satellites for use solely within the U.S. is treated in the submission to the F.C.C. Docket 16495 footnoted previously.

Department of Defense was persuaded to lease through the carriers at a rate of about $7,000 -- as against Comsat's earlier quoted $4,200 -- reflecting a composite cost of satellite and cable facilities. This outcome is consistent with the long standing policy of the FCC that rates for a service performed by a common carrier are not to depend upon the cost of a particular facility used, but rather should reflect the average of costs of all facilities old and new employed in that service. In the words of one commentator:

> The public interest may well require a diversification of facilities, and it is certainly not in the public interest to let Comsat use its present cost advantages to inflict serious harm on the carriers before they get a chance to try to make cable technology into a viable competitor. But such a policy has its social costs -- it could make international communications more expensive, and it inevitably slows the growth of the industry in general, apart from the new technology, in order to protect the value of possibly obsolete equipment.[1]

Cooperation and Economies of Scale

Conflict may arise between the most economical use of satellite technology and national interests perceived by individual governments. The large potential cost reductions discussed in the earlier sections are predicated on the notion of large-capacity satellite systems to take advantage of the economies of scale inherent in satellite technology. That is, the larger is the channel capacity of a system the smaller, generally speaking, is the per-channel cost. The kinds of worldwide services discussed above will require extensive sharing by numerous countries of common systems, if these economies of scale are

[1] Schwartz, op.cit., p. 472. The "30-channels" case is discussed in detail in Government use of Satellite Communications, op.cit. pp. 33-56.

to be enjoyed. To be sure, this does not mean that only one worldwide system operating as a monopoly will do. In the United States a separate system for domestic television distribution may not suffer serious disadvantage, because the very large television traffic volumes anticipated may be sufficient to exploit most of the potential economies of scale. Other countries may, under similar circumstances, find separate domestic systems economic. In general, however, extensive sharing of common systems will be essential. This in turn will involve complex agreements about a host of issues relating to such things as the sharing of ownership and control, rights of access to the system, questions of pricing and revenue sharing, and radio frequency allocations.

For a variety of reasons some governments may be tempted to establish their own separate systems to meet more limited domestic, regional and worldwide needs. The desire to exert a greater degree of control over the system, the hope of exerting general influence on other countries cooperating in the system, the desire to satisfy special needs inconsistent with the operation of an integrated larger system, and the prestige gained by appearing a leader in the exploitation of new and glamorous technologies, could conceivably lead to a proliferation of competing systems -- each small, each suffering from high unit costs, and together denying to society much of the potential payoff from technological progress.

Complementary Ingredients. Enamoured of a bright new technology, the observer can easily underestimate requirements for other essential ingredients. For example, parallel development of transportation and communications technologies, with each complementing and reinforcing

the effect of the other, is frequently of central importance: A promising business opportunity discovered in a remote region by virtue of improved communications would have little value unless transportation into the region were available; large jet cargo transports designed to lift military forces to anyplace in the world on short notice would be of restricted use without continuous and reliable communication with their control centers.

As another example, much discussion couched in glowing terms has been devoted to the potential of television, particularly in conjunction with satellite hookups, for educational purposes in less-developed nations. In view of widespread teacher shortages, rapidly rising school enrollments, and grossly inadequate school plants, television and satellites have been widely regarded as a new hope for improving the educational structure. Educational television is already being used in a number of countries. One of the most extensive efforts is in Colombia, where nearly 400,000 students per year are exposed to a classroom television series covering a variety of course material. However, a striking feature of the Colombian system is that its deficiencies have rather little to do with either television technology or with the absence of satellites.[1] The most serious problem is the severe lack of teachers adequately trained and motivated to use classroom television effectively. The Colombian experience suggests the pitfalls one encounters in pressing for a particular technological solution to a problem area without

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[1] In fact, television is a surprisingly well developed industry in a number of less-developed countries. There are over 2 million television receiving sets in Brazil, over 1 million in Mexico, and 200,000 in Colombia. At recent count, Brazil has 47 television broadcasting stations, Mexico 32, Colombia 14, Peru 20.

taking into account the crucial role of complementary ingredients.

COMMUNICATIONS AND NATIONAL SECURITY

In view of the extraordinarily rapid technological advances taking place, and the numerous promising applications, questions immediately arise about the implications for national security. The potential contribution of satellite technology to the problem of adequate communication in time of international crisis, and its use for command and control in wartime are two specific areas of concern. In addition, I shall discuss some broader implications relating to open and closed societies, the centralization and decentralization of decisionmaking functions, the process of bargaining and negotiation, the viability of alliances during crisis and war, and the long-run structuring and restructuring of national interests and alliances.

Communications and Crises

A tense confrontation between countries, a revolution or insurrection, or a local war, can quickly tax existing communications facilities within and among the countries involved. Not only do urgent government requirements mount for information about events and how to respond to them, but additional loads are imposed by anxious relatives and friends and by business firms with interests in the area. Despite the fact that radiotelephone is subject to fading, distortion and complete blackout due to vagaries of the ionosphere, it is still employed in many areas of the world.[1] Telephone and telegraph cables, though rendering

[1] Among other applications, it is used to link most of the less-developed countries of the world with the United States and with Europe, and in some less-developed countries it is widely employed for long-distance domestic service.

good quality service, have limited capacity to handle the special demands that arise in time of crisis.

A recent striking example of how facilities can be overtaxed is drawn from the recent Arab-Israeli confrontation. By the third day of the war, the American Telephone and Telegraph Company announced a backlog of 2300 telephone calls to Israel alone, and was informing customers of delays of up to 2 weeks. Not only had demand sharply increased, but problems were compounded by a magnetic storm, the result of sunspots,that hampered the use of radiotelephone facilities.[1]

The crucial importance of reliable communication links in evaluating and responding to crisis situations is well illustrated by the history of the "hotline" teletype link between Washington and Moscow. The cable hookup -- passing through Helsinki, Stockholm and London -- was established in 1963 to assist in coping with problems of miscalculation and accidental war. In the words of the New York Times:

> The need for a communications link was dramatized by the showdown over Soviet missiles in Cuba. At the height of that crisis both President Kennedy and Premier Khrushchev found events and decisions overtaking their exchanges of opinion and bargaining positions ... They were forced to send messages by open telephone and radio channels, leaving little room for private diplomacy.[2]

The value of the hotline was clearly brought home when it was used officially for the first time during the Arab-Israeli war. As pressure mounted and the likelihood of war increased, Chairman Kosygin and President Johnson employed the line to express their great mutual

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[1]Reported in New York Times, June 8, 1967, p. 50.

[2]New York Times, June 6, 1963, p. 1.

concern about the situation. During the war itself, when Egypt and Jordan asserted that American and British planes were involved in the fighting, Johnson notified Kosygin that these charges were unfounded. When the U.S. ship Liberty was subsequently attacked by Israeli forces, and U.S. carrier aircraft were dispatched to investigate and to render assistance, Johnson rushed to Kosygin assurances that these planes were not entering the battle. Altogether, more than twelve messages were exchanged over the hotline during the crisis.[1] In this context it is worth recalling that the hotline, consisting of continuously available leased space on a regular commercial cable, is not immune to breakage. In fact, in December 1966 it was accidentally broken -- in Finland -- disrupting service for nearly twelve hours.[2]

An obvious application of satellite systems is to provide an expanded and more adequate network available in time of such crises. For the not distant future, we could envision ground transmitting and receiving stations located in capital cities and at other points of importance. With a number of high-capacity satellites in orbit, and with the ability of the system to transfer capacity among points in the network to satisfy peak demands along particular links, service would be available free from the effects of ionospheric vagaries that

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[1] An interesting account of these events, from which the above description is drawn, is provided by Hugh Sidey, "Over the Hot Line -- the Middle East," Life Magazine, June 16, 1967, p. 24b.

[2] A brief account of the break was reported in the New York Times, December 20, 1966, p. 33.

plague radiotelephone and in a volume unmatched by existing or presently contemplated cables.[1]

National Command and Control in Wartime

With continuing technological advances, ground receiving and transmitting stations will be reduced in size to the point where they can easily be airlifted or transported by jeep, and carried on tanks, planes, ships and submarines. The U.S. Army already has under procurement contract a 23,000 pound terminal with an 18-foot diameter antenna suitable for airlifting in a single C-130E aircraft or by helicopter.[2] The Department of Defense tactical system calls for yet smaller, easily portable stations. The U.S. Federal Aviation Agency, in a joint government-industry experiment, has recently demonstrated the feasibility of satellite relays for long-range communication with aircraft employing relatively simple receiving equipment.[3]

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[1]The two INTELSAT satellites now over the Atlantic together have a total capacity (480 voice channels) roughly equal to that of all existing transatlantic telephone cables. For a good description of existing and projected cable and radiotelephone international systems see R. T. Nichols, High Capacity Submarine Telephone Cables: Implications for Communication Satellite Research and Development, The RAND Corporation, RM-3877-NASA, September 1963.

[2]Government Use of Satellites Communications, op.cit., 18-19. The military program also includes "transportable" rather than "portable" terminals with 40-foot antennas and weighing 123,000 pounds, and still larger fixed terminals with 60-foot antennas.

[3]An interesting amount of the prospect for satellites used with ships and aircraft is provided by Eugene Ehrlich, "The Future Potential of Navigation Satellites," AAS 67-101, Proceedings, American Astronautical Society, 1967.

Since satellite links would be free from the common ionospheric vagaries that affect conventional high-frequency radio, they would be valuable in both limited and general war. In nuclear war satellite links would be especially valuable because they would be less susceptible to nuclear "blackout" effects than is the case with conventional high-frequency radio.

On the subject of vulnerability, questions immediately arise about the possibility of enemy attack against the satellite system itself. How vulnerable are ground terminals? Cannot the enemy jam or destroy satellites in orbit? Without going into much detail here, I would make four points:

1) A variety of techniques are available for countering the threat of jamming, though generally at the cost of reducing capacity.

2) A satellite can, of course, be destroyed by an enemy warhead boosted into rendezvous orbit; but here we face the familiar "numbers" game. The larger the number of satellites in orbit, the smaller is the probability of destroying all or most of them with a given level of attack. If the satellite links are combined with backup landline and conventional radio facilities as well, the overall system can possibly be rendered quite an unappealing target.

3) As ground terminals become smaller, less costly, and more numerous they too will become less attractive targets. Not only will it become progressively more feasible to install emergency backup terminals, but reductions in their size will facilitate installation in hardened points.

4) Even in general war it is not obvious that the enemy would find it in his interest to destroy all communications facilities of the opposing forces. On the contrary, it may be in the interest of all participants to maintain communications with each other for the process of bargaining, negotiating and bringing the war to a close. In this process many instances can be imagined in which it would be in the interest of each belligerent for the opposing side to be able to maintain control over its own tactical and strategic forces.

Some Broader Implications

Open and Closed Societies. The expanded flow of communications will heighten the contrast between open and closed societies, and not necessarily to the advantage of the former. It is clear from earlier discussion that the national government will continue to have wide latitude in deciding the degree to which its own citizens will participate. It can build ground stations or not; it can choose to join international communications consortia or not; and it can monitor and filter incoming and outgoing telephone, telegraph and television traffic as it pleases. The open society, in contrast, will become that much more open. Its social, economic and political stresses and strains, especially of the sensational sort, will stand for the world to see; all the while, it must submit to whatever onslaught of outside material comes its way -- some objective, some distorted, some the grossest propaganda -- all more easily disseminated by virtue of the new and expanded communications facilities. Temptations and pressures to make the open society less open will mount.

One might ask whether new communications technologies do not themselves hold promise for penetrating the walls of a closed society. For example, there has been much talk, and some serious study, devoted to the possibility of developing a satellite sufficiently powerful to broadcast directly to home television receivers. [This case must be clearly distinguished from the systems described earlier in which programs would be relayed via satellite to ground receiving terminals from where the program would be rebroadcast in the conventional fashion to home receivers.] If such a satellite were built, could it not be used to carry programs to viewers even against the wishes of their national authorities? The answer is no. Satellite power requirements to broadcast directly to a conventional, unmodified home antenna would be extremely severe; so severe in fact that this approach is not being seriously contemplated, so far as I know, for the foreseeable future. What has been considered is a modified home antenna or receiver, housing a preamplifier and other equipment costing perhaps $50 to $100, as a means of reducing the satellite power requirement to a point where such a system might become technically feasible within the 1970's.[1] However, the system would be of little value in penetrating a country against the will of the authorities. The presence of modified home equipment, useful only for picking up satellite programs, would not be difficult to detect. Besides, it is not at all clear that many citizens would pay the equivalent of an additional $50 to $100 to receive broadcasts from foreign satellites, even if they were legally free to do so!

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[1] For example, the British Space Development Company has considered such a system for use in the United Kingdom, described by Fred Wheeler "Relay Stations in the Sky," New Scientist, January 19, 1967.

Centralized and Decentralized Decisionmaking. Implications also emerge for the centralization and decentralization of responsibility and authority in the structure of decisionmaking. Here two dimensions are relevant, (a) the hierarchal, relating to the allocation of responsibility and authority between higher and lower level decision-making units, (b) the geographical, relating to the locations of decisionmaking units relative to each other. With respect to the latter, the existence of instantaneous and reliable communication over long distances would reduce or eliminate distance as a factor in determining the relative locations of decisionmaking units. Other considerations of location, such as vulnerability to attack and access to transportation facilities, would have correspondingly greater weight. Since a distance constraint would encourage placement of decisionmaking units close to one another, everything else considered, its removal would promote geographical decentralization.

Effects on the hierarchal dimension are less clear. One might expect that the enlarged and more rapid flow of information to the decisionmaker and the greater ease with which decisions can be passed downward would together lead to a shift in responsibility and authority toward higher-level decisionmaking units -- home offices playing an enlarged role at the expense of embassies and foreign missions; tactical and strategic wartime decisions made at the highest levels; more frequent contact between heads of state engaged in "personal diplomacy" in time of crisis. At the same time, several possibilities suggest a tendency in the other direction: (a) better communications links between higher and lower levels might promote the delegation to

lower levels of more responsibility and authority than the higher levels, fearing loss of command and control in emergency situations, would otherwise be willing to confer; (b) direct and frequent high level contact between two opposing governments -- for example, direct communication between heads of state -- might generate criticism from allies and others that the two sides are conspiring. A government could be led ceremoniously to destroy or dismantle coding equipment and other facilities used for communicating with the opposing side, to assure its critics that high-level contact is being discontinued. As a substitute, more authority and responsibility might be delegated through the embassy level for less conspicuous contact with the opposing side. The shift would be facilitated by the existence of improved communications facilities between the embassy and the higher levels; (c) use of direct communications facilities for high level contacts might come to be regarded as a valuable signal of extreme urgency, hence as something to be employed only very rarely. In this case, the internal allocation of responsibility and authority would remain essentially unaffected during normal times.

Bargaining and Negotiation During Crisis and War

In several ways, the process of bargaining and negotiation would be affected. As one example, improved command and control by country x over its military forces, afforded by instantaneous and reliable communication, would enhance the ability of x to threaten or coerce country y. At the same time, this improved command and control would also make x more vulnerable to threats from y: a threat by y to attack

x if x attacks z would have little value if y knows that x has already launched an attack force against z, and that x does not have the ability (due to poor communications) to recall it.

Given the ability of both sides to communicate quickly with each other, and to formulate their respective positions more rapidly by virtue of improved communication within their own decisionmaking structures, additional opportunities might arise to explore alternative solutions, and to transmit clarifications and amplifications. This would contribute to reducing the probability of miscalculation and misinterpretation, and to discovering a basis for agreement more advantageous to both sides.

Of course, the mere existence of techniques for instantaneous and reliable communication does not insure that they will be employed. A refusal to communicate may, at times, prove advantageous. Especially, one side may deliberately avoid contact in order to insulate itself from threats by its opponent. In such cases, the role of new communications technologies would rest in expanding the range of choice available to the participants in either remaining in contact, or breaking contact, as an integral part of the bargaining and negotiation process.

Alliances under Stress. Several implications emerge regarding the effectiveness and viability of an alliance attempting to negotiate or bargain with, or to exert coercion against, an opposing side in time of crisis or war. The expanded flow of information from the field and elsewhere would enable the alliance to chose from an expanded list of alternatives and options. But the very fact that each member has

instantaneous, reliable communication with each other and with the opposing side creates problems: Members can more easily express their interpretations, hopes, fears, and misgivings; and they can more credibly threaten to negotiate separately with the opposing side. In addition, the opposing side has expanded latitude to initiate contact separately with members of the alliance. The situation is further complicated by the fact that if privacy is assured over the communications links, members would be unable to verify whether each other is in contact with the opposing side and, if so, what is being said.

In other words, instantaneous and reliable communication can strengthen the alliance, in terms of facilitating adjustment to new circumstances, maintaining unified command and control over military forces, and the like. But it also widens the latitude for internal disagreement and distrust, and it provides new opportunities for the opposing side to generate or exacerbate dissention within the group.

Some participants may find discomforting the obligations imposed by the expanded opportunities for communication with their allies. Preferring to play a lone hand in dealing with the opposing side, a government today may find convenient the argument that unreliable communications links with allies in time of crises and war would render effective coordination impossible. Or, a government exposed to an embarrassing unilateral action of an ally may plead, as a face-saving maneuver, its prior inability to communicate with that ally. The degree to which a member of the group really wants participation by its allies in coping with threats to itself and to others, and the rights and responsibilities of each member, may require painful reappraisal

in an era of improved communication.[1]

National Interests, Alliances, and Geography. Rapidly expanding and inexpensive telephone and teletype links and facsimile mail service across oceans and continents will contribute to shifts in foreign trade and investment flows. Together with the impact of widespread international television, new sympathies, antagonisms, and understandings will emerge toward the problems, plights and situations of others. New areas of foreign influence will develop as old ones evaporate. New economic, political and military alliances will emerge as a reflection of changes in relations and ties contributed in part by the expansion of worldwide communications.

Geographical distance will play a progressively less important role in shaping the character of this dynamic process. In combination with continued advance in transportation technology, the growth of worldwide communications will drastically reduce the barrier of distance to interactions between nations. People and governments will entertain altered notions of what does and does not constitute the "national interest" in international affairs. Hemispheric or regional "solidarity" will count for less, relative to solidarity defined in other dimensions. Expansion of influence close to home by an enemy may generate little more apprehension than the enemy's expansion of influence anywhere else in the world (though both situations may be

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[1]Within the context of U.S.-European relations, the conflict between collective and independent action is discussed by Alastair Buchan, Crisis Management, (The Atlantic Papers, NATO Series II), especially pp. 57-59.

very perturbing). The proximity of members to each other as the basis for mutual security pacts, common markets, and spheres of influence will count for less. New conditions will ripen for crises and confrontations, but the locations, the participants, and the pressures may vary considerably from those familiar today.