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INTERNAL AND EXTERNAL INFLUENCES ON CHINA'S SATELLITE PROGRAM

By

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ABSTRACT

INTERNAL AND EXTERNAL INFLUENCES ON CHINA'S SATELLITE PROGRAM

By

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This paper uses Mody's contextual analytic framework to reconstruct some of the major internal and external forces which influenced China's decision to initiate its independent satellite program and to explain how historical changes in the internal and external environment have brought about China's modification of its policies governing the satellite program. The paper highlights the centrality of national strategic considerations, namely, national security, prestige, and later, profit-making, in the decision making process. It argues that in examining and analyzing communication policies and/or communication technologies, it is necessary to place them against the interrelated and ever-changing domestic and international context.

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CHAPTER 1

LITERATURE REVIEW

Today a considerable number of Third World countries have adopted satellite technologies for development purposes. Some, including India, Brazil and China, have even developed their own space capabilities. While it makes sense in some ways to see this trend toward modernization as a single global process, one should not ignore the specificity of each individual country, especially with regard to how "development" is defined, why the satellite technology is adopted or developed and how it is applied.

The thinking on information technologies in development must begin with development thinking itself. When the attention of communication scholars and economic planners was turned to Africa, Asia and Latin America in the 50s and 60s, the assumption was that if enough economic aid and technical assistance were provided, the developing world would follow the same pattern of industrial development that the west had followed. Influenced by Rostow's stages-of-growth model (1960) and Lerner's modernization paradigm (1958) policy makers and development administrators believed that industrialization of developing countries, coupled with the introduction of mass media, would result in higher GNP, a higher level of employment and media consumption, and, therefore, a higher standard of living and wider economic and political participation. It was also held that if the general population could only be exposed to information on new farming methods, birth control, nutrition, and so forth, innovations would be accepted, new behaviors would be adopted, and rapid social and economic advances would occur among both the urban and rural poor. In other words, development communication was conceptualized in the same ways that persuasive communication had been conceptualized within the value system of a western free market context -- communication channels provide information which individuals act on in order to further their own self interests. With the assumption that the western model of modernization and development was universally appropriate and desirable, little consideration was given to preexisting values and beliefs, and the social and cultural milieu in which development was to take place.

In the 1960s, Everett Rogers' more sophisticated diffusion of innovations model (1962) focused on rural communication transporting the American experience with the adoption of farming innovations to the Third World. The diffusion model, however, received criticism from Third World communication scholars and practitioners as being linear in nature, posivistic in its approach and insensitive to social and cultural contexts. Rogers himself eventually became critical of the diffusion model, recognizing its failure to focus on the processual nature of communication, its pro-innovation bias, its western research biases, its disregard for political and ideological conditions, and its narrow psychological orientation (Rogers, 1976).

Beltran (1976) is one of many constructive critics of the basic assumptions of diffusion communication research who have questioned whether communication itself can generate development regardless of social, economic, and political conditions. He expressed discontent with the application of "made-in-the-USA" type communication research to the different conditions of Latin America and other countries. The basic assumptions he questioned were: a.) that communication by itself can generate development, regardless of socio-economic and political conditions; b.) that increased production and consumption of goods and services constitute the essence of development, and that a fair distribution of income and opportunities will necessarily derive in due time; and, c.) that the key to increased productivity is technological innovation, regardless of whom it may benefit and whom it may harm (pp. 110-111). He asked,

> If, in fact, communication (in this case, in the form of innovation diffusion) is such a powerful and autonomous force, why worry much about the nature of society? If development consists essentially of producing more and better products so that "everybody" can have them, why should one be concerned with overall social, economic, cultural, and political factors? If technology is so good by itself that it only needs to be communicated to other people in order to generate development, why indeed bother with any noncommunication variables? Finally, why should the prevailing social structure of Latin America require substantial modifications? (p.111)

Beltran recommended directions for future communication research, such as an increased attention to studying mass media institutions and how they operate as part of a larger system. He emphasized the need to alter communication research orientations so as to contribute more directly to societal needs and at the same time fulfill its role in international intellectual advance.

In Communications Research and Cultural Values (Dissanayake, Ed., 1983), a series of papers raised questions regarding the subservience of the social sciences to natural sciences and reiterated the dissatisfaction with the traditional positivistic approach which puts a premium on objectivity, replicability, value freedom, and quantification but ignores the broader social, cultural and political milieus in which communication takes place. Dissanayake and Belton discussed what they called "critical approach" based on the Frankfurt School line of thinking.

They stated that the great strength of the Frankfurt School has been the relentless insistence on the need to understand human sciences in the greater context of living in a culture and its rejection of a context-free method on the grounds that such a method itself is a distortion of the contextual dialectic of the tacit whole and articulated parts on which rests scientific rationality. By way of conclusion, Dissanayake and Belton said that a non-positivistic, interpretive and critical approach to the study of communication may prove more productive in the Third World in that it is more in consonance with the social needs and the cultural presuppositions of people. In more recent years, there seems to exist a move toward an integration of theories and a historical/contextual/analytic framework (Buck, et al., 1983), a framework that addresses such fundamental questions confronting the Third World as power structures, social structures, indigenous belief systems and political ideologies -- factors related to the control of social and economic resources, wealth and decision making. This trend can be seen as an effort to search for adequacy of the theories and methods, with locally generated elements, and made pertinent to the concrete social reality, its processes and mutations (Nurula & Pearrce, 1990).

Mody (1985, 1987) and Mody & Ferreira (1988) used a "contextual analysis" model to examine how political, economic, sociocultural and technological dimensions relate to the diffusion of the satellite technology in Third World countries. Figure 1 illustrates the elements of communication systems forming the contextual framework. These elements include ownership, financing, management, professional values, training, hardware, software and beneficiaries. They are influenced by and have effects on the scientific-technical, socio-cultural, economic and political factors and actors that tend to operate on three levels: foreign, national and sub-national. Clearly an interpretive approach, this model recognizes the fact that communication research does not exist in a vacuum. The adoption, production, dissemination, and utilization of a communication technology is inextricably linked with the political, economic, socio-cultural and scientific-technical environment in which such actions take place. The model also recognizes that communication systems are not constant -- they change as the context changes. The studies led by Mody typically look at domestic broadcasting corporations, foreign equipment manufacturers, the national telecommunication equipment industry, and international banks as economic actors and factors; powerful domestic and foreign interest groups including the party in power, the nature of the state, and superpowers' politics in the political arena; international satellite research and development pioneers (e.g., NASA), foreign spacecraft manufacturers, domestic scientists and engineers, PTT's, and private broadcasting interests as scientific-technical forces; and pressure from domestic elites seeking the newest technology, "nationalist" interest groups pushing for disassociation from the world business system, foreign universities and/or philanthropic foundations urging the use of the new technologies for education and development as cultural motivations. The dissection and analysis of roles of different actors and factors enable comparative analysis of the adoption and applications of satellite communication technologies by Third World countries and produces a more sophisticated argument that transcends unidimensional accusations and gross generalizations (Mody and Borrego, 1991). Mody and her associates highlighted the central role of national prestige, political power and economic privilege in decision making on communication. The consistent pattern in priority setting points to the potency of a country's political structure and attitudes in influencing the adoption and development of a communication technology. Mody (1987) pointed out: Economics, political and cultural societal macro-level factors are often dismissed by communication scholars as extra-communication variables within the purview of the sociologist, political scientist and anthropologist in favor of the ideal "rational" efficiency and effectiveness criteria for the analysis of actual performance. The preference for the "rational" prescription has proven inadequate in explaining the reasons behind the adoption of such an information technology as the satellite (pp. 151-152). The statement reiterates the importance of understanding the complexity and multidimensionality of the communicational phenomena and process because they operate within the complexity of the societal, political and cultural systems and processes, not in spite of them.

CONTEXTUAL ANALYSIS

ILLUSTRATIVE
CONTEXTUAL CAUSES

ILLUSTRATIVE
CONTEXTUAL EFFECTS

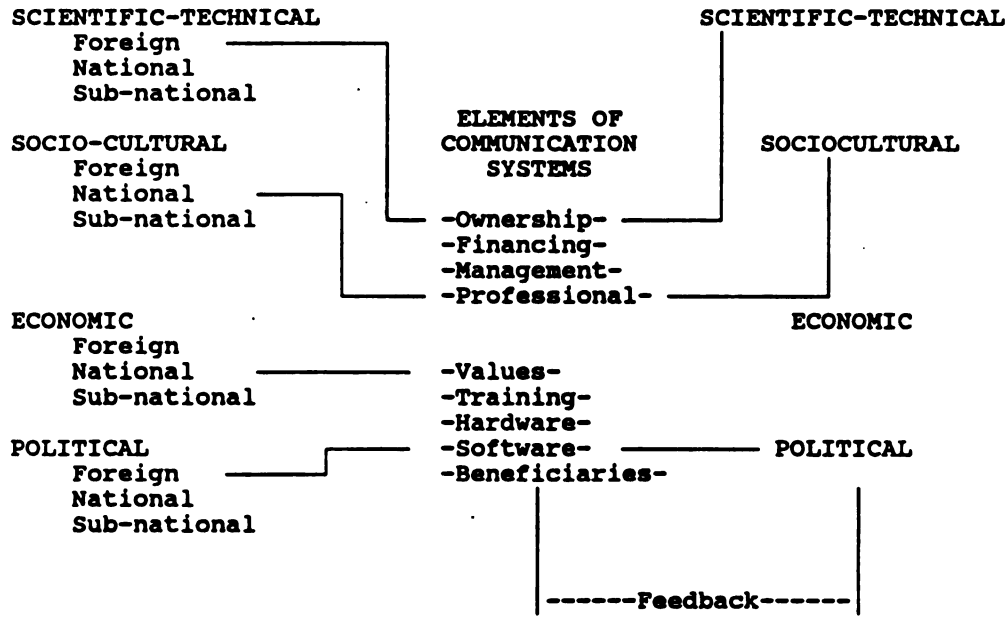

Figure 1

Contextual Determinants and Contextual Consequences of National Communication Technology Systems

Source: Mody, (1985, 1987)

CHAPTER 2

OBJECTIVES

This paper uses Mody's contextual analytic framework to reconstruct some of the major internal and external forces which influenced China's decision to initiate its independent satellite program and to explain how historical changes in the internal and external environment have brought about China's modification of its policies governing the satellite program. This is done by artificially separating the program into two phases, with Phase I spanning 20 some years -- from 1960s to 1970s-- when national security and national prestige took on an importance unmatched by any other considerations, and Phase II, beginning early 1980s, which saw significant policy changes in China marked by the effort to commercialize the multi-billion dollar satellite launch services on the Long March boosters and the emergence of satellite technology application in the civilian sectors.

Specifically, the paper will examine the geopolitical situation, such as China's relations with the two superpowers, the Soviet Union and the United States, China's domestic events and important actors closely associated with the satellite program, the historical and cultural legacy, nationalism and national defense, agenda-setting in science and technology, and several other factors which interacted with each other and combined to prompt China to join the world's space faring club.

Using a historical/contextual approach, the paper aims to address the following research questions:

1. Why in China national security, military concerns, and prestige reasons dominate the decision making process, and why in China and, by analogy, in Third World countries, the introduction of satellite technology has more to do with political/geopolitical and cultural forces and less to do with technical efficiency and cost effectiveness than our research and policy usually acknowledge (Mody, 1985, 1987)?
2. In examining and analyzing communication policies, why is it necessary to place them against the interrelated and ever-changing domestic and international context?

While Mody's model provides a rather good general catalog of contextual forces, the studies led by Mody do not specifically touch on the national security aspect of the satellite technology, which stands out in China's satellite program. Unlike India or Brazil where the satellite technology was initiated in close collaboration with foreign countries and the world organizations largely for civilian purposes, China's satellite program started as a military undertaking behind closed doors, its roots lie in the military missile programs of the Cold War era. As such, China's satellite program has its own characteristics quite distinct from those of other Third World countries.

It would appear that not all the contextual factors listed by Mody are suitable for China, and due attention should be paid to the particularities and idiosyncrasies of the country. For instance, instead of adopting satellite technologies from either the Soviet Union or the United States, China chose a long and tortuous path to develop its own capabilities from scratch. Therefore it does not have the contractual and dependency relationships with foreign spacecraft manufacturers and launchers. The centralized nature of the satellite technology and its military orientation in China, in Phase One at least, prevented the subnational factors from playing the type of roles as was found in India and Mexico. The Central government in China assumed, and still does to a large extent, the sole responsibility for funding and coordinating the program, and individual provinces did not participate in the decision making process. In India, Brazil and Mexico, however, the decision making process is the outcome of constant negotiations and bargaining between and among various political parties, interest groups, advertisers, foreign enterprises and local industrial lobbyists. These subgroups play significant roles in shaping the policies governing the adoption, utilization and future development of the satellite technology (Mody, 1985; Mody & Borrego, 1990; McAnany & Nettleton, 1987). In China such entities were and have been more or less absent.

Also, in China the economic argument is usually treated as of secondary importance compared to the larger and more pressing issues, such as national security. It was not until the early 1980s that China began to enter partnership with the outside world following Deng Xiao-ping's economic reform and "open to the outside world" policies. As more factors and actors enter into the picture, Mody's model becomes more pertinent, because it is now possible to look at how economics begin to tip the scale of the country's satellite program and how cooperative ventures with foreign countries in satellite-related projects affect China's space policies. Still major differences exist. While countries, such as Mexico, are concerned with their technological dependence on foreign software and hardware, China is taking steps to seek cooperation with foreign countries out of the realization that the country can benefit from the valuable experiences of other countries so that its own route to success can be significantly shortened, saving time and financial resources (Tu, 1988). In spite of the differences, however, there are parallels to be drawn between China and the rest of the satellite using Third World countries, especially in terms of how priorities are subject to political power and political ideologies and how cultural factors, such as nationalism, enter the realm of policy making. And all can offer valuable lessons as to the strength and pitfalls of various approaches to space communication. In that regard, Mody's model does offer a useful parameter for comparisons and contrasts between Third World nations.

In recent years China's space program has provoked increasing international attention following its decision to commercialize its Long March launch services and to make details of its operations and achievements available to outsiders. China is now recognized as a contender in space with tremendous potentials. This growing interest was reflected from mid 1980s onwards in a dramatic surge of articles on the subject. For instance, Aviation Week and Space Technology, The China Business Review and Space Policy carry up-to-date information about China's space activities. The major historical records on China's space program come from two books: Contemporary China's Space Effort (Zhang et al, 1984) and Memoirs of Nie Rong-zen (Nie, 1984). Two western works also provide valuable insights into China's political and military background. These are "China's Nuclear-Missile Program: Regional or Intercontinental?" (Hsieh, 1971) and China Builds the Bomb (Lewis and Xue, 1988). Bradley Hahn (1986), Vincent Kohler (1989) and Craig Covault (1985,1987) have done extensive interviews and research in more recent years. Hahn provides a comprehensive list of China's spacecraft launch statistics, including the perigee and apogee of the satellites, their international designations, weights, estimated life and date of decay, while Covault obtained first hand information through a trip to China with a U.S. space team (p. 11). Kohler also toured space installations throughout China in 1987 (p.71) and filed stories from Xichang Satellite Launch Center in southwest of China near Burma. For the most part, the works by the above-mentioned three authors have been highly descriptive, focusing primarily on such things as the types of services on offer, payload capabilities, launch facilities, manufacturing infrastructure, latest space advances, etc.

The aim of the present thesis is to go beyond a descriptive treatment by focusing on the whys and wherefores behind China's satellite program, and the internal and external dynamics and their relations to China's satellite policy and policy changes. Such an approach, it is hoped, will contribute to a better understanding of China's communication development policies and the decision-making process.

Historical documents, memoirs, articles and reports in newspapers and trade journals published both in China and the west not only provide important data but also serve as balance between differing views and ideologies. In addition, a telephone interview was conducted with the Great Wall Industry Corporation to obtain the latest information regarding China's joint ventures and agreements with foreign countries. Because this paper adopts a historical/contextual/analytic perspective, major internal and external factors and actors are identified and their roles critiqued within the framework of a historical review of the Chinese satellite program. In other words, major events related to the satellite program are enumerated, preceding the discussion of motivations and rationales. The political and economic climate in China has changed often and wildly since the country's satellite program was founded. However, the program itself, along with the motivational forces, has remained relatively stable. It has consistently received support from the highest level of the Chinese government and spurred by the national desire to catch up with the technologically advanced nations. The emergence of the economic actors and factors in Phase Two should be seen as contributing to the evolutionary process of the Chinese satellite program, not as fundamental changes.

CHAPTER 3

INTERNAL AND EXTERNAL FACTORS/ACTORS

PHASE ONE (1960s-70s)

China launched its first low earth orbit scientific satellite (PRC-1) on April 24, 1970, from Jiuquan, Gansu Province, in the northwestern part of the country. It might have seemed faintly ludicrous to the rest of the world that the satellite's instrument payload was a transmitter that broadcast "The East Is Red," a song paying tribute to Chairman Mao Zedong, and announced the time as it passed over various parts of the world. But China, the backward land of mud roads and bare-footed farmers, had orbited a satellite all on its own, its payload heavier than the first Russian satellite and the first American satellite combined. PRC-1 was held both in China and the west as a milestone, signalling the country's entry into the exclusive space-faring and satellite using club.

3.1 Space Program as Big Science: Prestige and War-preparedness

A number of factors and actors contributed to the success of the event. They are: China's need to prepare for national defense; the desire for political and cultural self-assertion and prestige in the international arena; and, finally, support from the highest level of the central government.

As has been mentioned earlier, China's satellite program can be traced back to its military-oriented research and development. The space program got under way in 1958 shortly after the establishment of the State Scientific and Technological Commission. Premier Zhou Enlai was then designated to establish and direct a space program organization to include institutes, factories, and test facilities. Initial space program research and testing included sounding rockets and high-altitude balloons. These nonorbital launch vehicles probed the earth's upper atmosphere, measuring meteorological conditions, cosmic radiation, magnetic fields, and undertook instrumentation and space biological experiments. This initial effort provided considerable knowledge and experience in manufacturing modern rocket motors, instruments, and ancillary equipment.

Based on Nie's memoirs and other historical documents, Chen (1991) summarized some of the other major events and actors in this initial period as having influenced and encouraged the development of a strong space effort:

* In January 1956 Chairman Mao Zedong called for a major national drive to upgrade China's scientific capabilities, signalling a willingness on the part of the leadership to support "big science" in China.
* In February 1956 Dr Qian Xue-sen issued a proposal to the central government entitled "Proposal to Establish China's Defence Aviation Industry." Dr Qian had recently returned to the country from the USA, where he had been actively involved in the US army's missile program as a jet propulsion specialist. He was later to become the father of China's space program.
* The establishment of the Fifth Academy of the Department of Defence. This military organization was given primary responsibility for developing China's space program. It served this function until 1964, when key elements of its role were transferred to the Ministry of the Seventh Machinery Industry.
* Cooperation with the USSR to acquire Soviet missile

technology. In September 1957 a Chinese delegation visited the USSR to negotiate a cooperative agreement. On 15 October 1957 a bilateral agreement was signed in which the Soviets agreed to help the Chinese develop rocket technology. In 1958 the USSR pledged to help China build three R&D institutions that would focus on missile development. Two sample Soviet P-2 rockets were shipped over to China to provide the Chinese with a close look at operational missile technology.

* The decision to build short-medium-range rockets independently following the withdrawal of all Soviet technical assistance for China's missile program. In February 1961 the Fifth Academy decided that all attention should focus on developing independent capabilities to build short-medium-range missiles. China's first attempt to launch a missile on 21 March 1962 failed. The first successful launch occurred on 29 June 1964 and the first successful launch of a fully operational medium-range missile occurred on 26 December 1966.
* The commitment to producing satellites. After the Sputnik launch Dr Qian and his colleagues initiated a plan to develop satellite building and launching capabilities. Activities related to this plan were given the name "Mission 581." A major component

> was the call to build three satellite and launch design institutes. The First Design Institute was established in August 1958. In November it was moved to Shanghai and renamed the Institute for Generator Design of the Chinese Academy of Sciences. The Chinese leadership's commitment to developing satellite capabilities was demonstrated in Mao Zedong's 1958 declaration to the Second Plenary Session of the Eighth Central Committee of the Communist Party when he said: "We, too, must make artificial satellites." (pp. 117-118)

The successful launch of PRC-1 gave rise to mammoth parades and celebrations in China. The political statement is a strong one, and the propaganda opportunities occasioned by the events were prominent: the Chinese press spoke profusely of China's enhanced international status and prestige and the power of the newly founded People's Republic in the struggle against the U.S. imperialism and the Soviet social imperialism and in the effort to forge human development in a safer environment (Hung, 1970: P.32). Harsch (1970) observed that although China was still a long way from reaching equality with Russia and the United States, the world had ceased to be a two-power world. He also emphasized how this event raised China's ability to influence its neighbors and how it changed the perceptions of the small and underdeveloped countries which now looked up to China for leadership.

However, China poured enormous resources into the satellite program not just for its symbolic and prestige values, it also had strong military implications. One would recall that shortly after the founding of the People's Republic in 1949, the U.S. fought the Korean War, which became a major factor responsible for setting relations between China and the U.S. in a state of enmity and mistrust. Regarded by China as a clear provocation aimed at the Chinese communist government, the war also contributed to the U.S. policy of "containing" the Chinese threat through a trade embargo and travel restrictions, as well as through military alliances with other Asian nations. Another side effect of the war was that Washington became more and more committed to Taiwan's defense, making the possibility of Chinese reunification more remote. Sino-American relations saw no improvement in the 1960s. To the Chinese leadership, the U.S. threat was as imminent as it had been, especially as the U.S. became increasingly involved in the war with yet another Chinese neighbor -- Vietnam.

On the Sino-Soviet side, strains in relations gradually began to emerge in the late 1950s over questions of ideology, security, and economic development. China was dissatisfied with the insufficient degree of support Moscow showed for Beijing's recovery of Taiwan, Soviet neutrality during the 1959 tension on the Sino-Indian border, and Soviet reluctance to honor its agreement to provide nuclear weapons technology to China. In sum, the major ideological, military and economic reasons behind the Sino-Soviet split were essentially the same: for the Chinese leadership, the strong desire to achieve self-reliance and independence of action outweighed the benefits China received as Moscow's junior partner. Following the withdrawal of the Soviet advisors from China in 1960, the Sino-Soviet dispute escalated to include territorial issues, culminating in 1969 in bloody armed clashes along the border. A year earlier, in 1968, the Soviet Union had moved missiles near the Chinese border, and installed long-range missiles to which nuclear warheads presumably could be fitted (Christian Science Monitor, April 29, 1970, p.2; p.4).

It was against these circumstances, clouded by the growing fear of war with the U.S. on the one hand and the Soviet Union on the other, that Mao sounded the warning that the danger of a new world war existed and that people all the world over should be prepared (Mao, 1970). His call "We should produce artificial satellites too" should be regarded as a step toward mobilizing people in preparing for a possible war (Hsieh, 1971). Given the extreme tension China was experiencing, it is not surprising that following PRC-1 and 2, six reconnaissance satellites were launched in the late 70s, including two whose capsules were recovered (see Appendix A).

Clearly, the Chinese satellites in the 70s did not, and were not meant to, produce any economic benefits. The primary motive was a geopolitical one. The satellites were used, more or less, as a sort of deterrence and, in a way, as a tranquilizer when the country was surrounded by hostile forces. The major objective was to make the world aware that China was a military power to be reckoned with (Harsch, 1970). For instance, what was the significance of China's first satellite in terms of "war preparedness" or national security? Of course the satellite was experimental in nature, and did not have specific military missions. But as Hughes (1970), in reference to China's Intercontinental Ballistic Missiles capabilities, pointed out, "It takes little expert knowledge to figure that if China can put a 380-pound satellite in orbit around the earth, they are advancing fast down the road to long-range rocketry." The New York Times (1970, April 26, p.1; p.2) directly pointed out the significant impact of the unspoken message behind PRC-1: China now had the capability of delivering atomic and hydrogen bombs to any point on the earth's surface. The paper went on to say, "China may have chosen the satellite method of testing its rockets, thus scoring a more impressive technological feat than the test firing of a long range missile." (p. 2)

In view of the fact that China did not go out of its way to emphasize the peaceful uses of the space achievement (Hsieh, 1971), it was no surprise that North Korean leaders related the launching of China's first satellite directly to the strengthening and developing not only of China's scientific technology but also of China's "defense capabilities" (Xin Hua News, 1970). The Committee of the Communist Party of Burma, which described China's achievement as dealing a heavy blow to the U.S. imperialism and Soviet social imperialism, also said, "It is a powerful check to the moves of these imperialists to carry out nuclear war threats and re-divide and dominate the world, and once again shatters their monopoly over nuclear weapons and rockets ..." (Xin Hua News, 1970). The Chinese foreign language news bulletin, Beijing Review (or Peking Review, as it was then called), itself carried an article connecting the development of nuclear weapons and space technology (Hung, 1970).

Summarizing the global impact of China's achievements in space and other military technologies, Chinese leader Deng Xiaoping put it in a subjunctive mood, "If China had not exploded atom and hydrogen bombs in the 1960s and launched satellites, it would not have been considered one of the three big powers and would not occupy such a position in the world. These things can mirror the capability of a nation and symbolize a country's vigor and prosperity" (Beijing Review, 1990, p.21).

3.2 Domestic Context: Political and Financial Support; Nationalism and R & D Policies

China's isolationist posture in the international arena in the late 50s and throughout the 60s was matched by dogmatic and radical practices at home. The inception of China's space program coincided with the ill-fated "Great Leap Forward," 1958-61, an ambitious campaign designed to transform the country at one stroke into a developed nation. The emphasis of the campaign was placed on accelerated collectivization of agriculture, national self-reliance and self sufficiency, and mass mobilization based on political zeal rather than careful planning. The result of the campaign was a severe economic crisis that led to widespread famine between 1959-62. The Great Proletariat Cultural Revolution, started in 1966, landed China into another chaotic situation. Unlike the Great Leap Forward, the Cultural Revolution was primarily a political upheaval, and did not produce major changes in official economic policies or the basic economic model, but its disruptive influence was felt in almost every facet of social life in China.

China was in a mess. Mao and his followers in the Central Committee well understood that some stability was in order. They needed a new and unifying rallying call. Now that the country was unable to make progress on the whole broad industrial front, the Chinese leadership decided to concentrate on a few special projects including the satellite technology (Worden et al, eds, 1988). In order to boost the morale of the nation, Mao repeatedly made the statement that China, with its vast territory and unmatched man-power, ought to make a greater contribution to humanity in fighting against all "reactionaries" in the world and in forging human development (Mao, 1961-1976). As his congratulatory message for the successful launching of the country's first satellite indicates, Mao saw the satellite program as being able not only to help establish stability and order at home and to make contributions to the world but also to provide the country with a fresh source of nationalism (Mao, 1970), which leads us to one of the socio-cultural and psychological phenomenon related to the Chinese satellite program.

The Chinese nationalism is intricately tied up with its history and culture. China has a brilliant history of contributions to astronomy, a science in which observations made by the country's astronomers more than a thousand years ago still provide important data. China's ancient inventions include, among various other things, gunpowder and rocketry.

Even western authorities credit China with this contribution to mankind, as is recorded in Space Travel, A History:

> Most authorities believe the invention of rockets is tied inextricably to the discovery of black powder which served as the first rocket propellant. The best available evidence, including both early Chinese documents and the writings of some of the first Europeans who visited China, indicates the Chinese certainly were the first to use black powder and, therefore, probably the first to use rockets as well. (von Braun, 1985, p.22).

The Chinese are proud of their past glories, of which the ancient inventions were a part. They also believe that these glories will be restored some day. As Worden et al (1988) pointed out, just as Chinese national pride has been a natural outgrowth of China's long and rich historical tradition, the nationalism of Chinese leaders also has derived from injustices China suffered in more recent history, in particular, China's domination by foreign powers from the nineteenth century until the end of World War Two. During this period, often referred to as "the century of shame and humiliation," China had to sign unequal treaties and grant foreign powers special privileges of extra-territoriality whereby they could set up concessions and settlements and divide China into spheres of influence. The most debilitating and humiliating of all was Japan's invasion and occupation of China in late 1930s until 1945.

The bitter recollection of China's suffering at the hands of foreign powers was undoubtedly a source of the Chinese nationalistic sentiment that was transformed during the Cultural Revolution into extreme xenophobia. Unrealistic claims at the time could be heard everywhere in China that the country could catch up with and surpass the most developed countries in the west within a dozen years. The successful launching of the PRC-1 only strengthened the desire to play "catch up."

PRC-2, a geodetic satellite carrying two telemetry systems and powered by solar cells, was launched in 1971, only ten months after PRC-1. The speedy pace certainly did not please the U.S. or the Soviet Union. Perhaps the weightiest of the meanings is that China entered both nuclear and space ages without assistance from either of the two superpowers; indeed, in spite of them. The Chinese press attributed the accomplishments in space to Chairman Mao's policy of independence and self-reliance. Hung Yu's commentary particularly mentioned that "not one foreigner took part in the work, not one foreign specimen or foreign-made article was made use of" for the entire satellite project. His remarks were reminiscent of Premier Zhou En Lai's remarks on China's first detonation of a nuclear device: "Have we not ... exploded an atom bomb? has not the label 'sick man of the East' fastened on us by westerners been flung off?" (Hsieh, 1971, p.92) Zhou was a strong supporter of the satellite program because he cherished the strength and prestige it conferred upon China in the international community (Nie, 1984).

In the height of the Cultural Revolution in 1968, ordinary workers in laboratories, factories and launch facilities emulated their colleagues in other industries and began criticizing and chastising their superiors. The scientists and engineers themselves split into rival camps and launched campaigns to discredit each other. Progress in the space program was on the verge of a grinding halt. Zhou was afraid that the huge investment in space would prove to be abortive, he consequently instituted special measures to protect it. He made numerous visits to the Ministry of Seventh Machinery Industry and space program sites and had the Ministry's Committee of Military Administration identify scientists and engineers working in the space program so that they would receive special protection under a Martial Law imposed specifically within the Ministry (Nie, 1984).

At the other end of the political spectrum the Gang of Four (Wang Hong-wen, Zhang Chun-qiao, Yao Wen-yuan and Jiang Qing), otherwise known as the Gang of Shanghai, were also enthusiastic backers of the space program because they viewed it as a symbol of their ability to carry out sophisticated undertakings and as a potential vehicle for self-glorification (Chen, 1991). In 1970, they supervised and were directly responsible for the building of the Shanghai Space Research and Production Base, which was comprised of the Shanghai Institute of Satellite Engineering, the Shanghai Institute of Launch Vehicles and the Heavy Rocket Engine Test Station. The efforts of the Shanghai base duplicated existing efforts being carried out in Beijing. While Beijing focused on developing Long March launchers and East is Red satellites, the Shanghai group worked on developing what was called "Storm" launchers and their own variety of satellites. The efforts of the Shanghai group quickly paid off with the launch of the Storm-1 rocket in 1972. In the next few years, the Storm-1 launchers would put several satellites into orbit.

The strong support offered by the leading figures in the Chinese government, no matter where they stood in the domestic political rivalry, enabled Dr. Qian and his colleagues to engage themselves in research activities, undisturbed by the general turmoil of the Cultural Revolution and the inadequate supply of practically everything in normal Chinese economic life.

Admittedly the satellites did bring national pride and prestige, but one has to bear in mind the tremendous human cost that was involved, especially if one recalls the poverty, famine as well as the political turmoil associated with the period when the satellite program took off. Chiding the Chinese leaders for not paying attention to the needs of their people, Soviet writer, Krasnaya Zvezda, in an article on Chinese military strategies, pointed out that resources in China had been allocated without any consideration to the overall national economy, and basic requirements for a modern industry (New York Times, April 27, 1970). Although Zvezda's comment represented the Soviet polemics aimed at any of its "satellite" countries that had the guts to deviate from the bloc, it did point to the unique socio-cultural and psychological phenomenon in China in which economic interests could be sacrificed for what is called in China -- Zheng Chi -- which means "to add glory or lustre to one's face," or "to make a good showing" under adverse circumstances. The word "Zheng Chi" applies specifically to underdogs, so if a child from a poor peasant family has achieved good scholastic scores upon graduating from a college, he makes a good example of "Zheng Chi." By the same token, if a poor nation, beset with external pressures and sanctions, can somehow survive and thrive based on its own resources and relying on its own strong will, it can also be said of having "Zheng Chi-ed."

Significant achievements in space technology, including the successful retrieval of three satellites in the 70s (in 1975, 1976 and 1978 respectively, see Appendix A) and the simultaneous launching into predetermined orbit by a single carrier rocket a group of three spacephysics experimental satellites in 1981, stood in contrast with few successes in other fields. The variation in achievements reflected concentration, or, rather, over concentration, of resources in what the leadership considered to be the "key institutions", or, "strategically vital technologies." These institutions and technologies, unlike other industrial sectors, enjoy the latest in modern technology, the support of a comprehensive industrial complex, a highly trained contingent of scientific and technical personnel and the first priority in funding (Hahn, 1984). In studying these institutions and technologies, one should not ignore the Chinese government's preoccupation with national security, self-determination and self-assertion, its unique way of interpreting development in terms of national power and international status, as opposed to the gross national product and higher standard of living, and the "Zheng Chi" factor as it relates to the self-concept of a nation and the morale of its people.

The following is a matrix (Figure 2) of illustrative factors/actors influencing the Chinese satellite program from the initial period through 1970s. It highlights the central role of the key figures in the Chinese government, Mao, Zhou and Gang of Four, and their strong political will to invest in this high cost technology for national defense and for prestige even if it meant making tremendous economic sacrifices.

	Economic	Scientific/ Technological	Political/ Geopolitical	Cultural
Foreign		cooperative ventures in missile with USSR in late 50s	perceived threat from superpowers; preparation for war	
National		Dept. of Defence;Ministry of 7th Machinery Industry; Group of scientists led by Dr. Qian	national security & defence; support from highest level ie, Mao,Zhou & "Gang of 4"	"Zheng Qi" factor; nationalism; China's historical contribution to rocketry
Sub-national			Shanghai as second base for space research	

Figure 2

Matrix of Illustrative Factors/Actors Influencing the Chinese Satellite Program Between 1960s-70s

CHAPTER 4

PHASE TWO: NEW FACTORS AND ACTORS

After more than 20 years of development, China has attained an appreciable level of space technology to say that it has made China's presence felt in the world's space faring club as well as to think about the economic profits to be gained from the past investment. For the first time since the Communist Party came to power, profit-making as a concept began to be accepted as not incompatible with socialism. The shift from the previous high-pitched revolutionary rhetoric to more down-to-earth pragmatism is again brought about by a combination of internal and external factors.

On the external level, China has normalized its relations with both the United States and the Soviet Union. It has also established friendly relations with almost all but a few nations in the world. Such actions can be seen as part of the general thaw of the Cold War era. China can now conduct its foreign relations without the sense of overwhelming threat from one or other of the two superpowers.

On the internal level, with the ascent of Deng Xiao

Ping to the top position in China, the country began to undergo several economic reforms which resulted in significant increases in agricultural and industrial outputs as well as in volume of foreign trade. In the meantime, the Chinese leadership has shown some willingness to extend the definition of self-reliance to permit substantial imports, foreign loans, investment, joint ventures, and overseas training of scientists and engineers including space engineers and managerial personnel (Aviation Week and Space Technology, March 10, 1986. p. 141).

Notwithstanding problems such as inflation and official corruption that have led to popular discontent, achievements have been remarkable. The satellite program is no exception. Specific changes in the satellite program center around the application of the satellite technologies (e.g., meteorology, remote sensing, broadcasting and telecommunications) in the civilian sector and the commercialization of the "Long March" launching services for profit. To be sure, geopolitics and prestige reasons are still salient motivating factors, but so are economic reasons and, from the administrative point of view, national unity and cohesion, as we shall see.

The following policy moves since the 1980s show the major internal and external influences on the evolution of China's satellite program and the gradual process toward a relatively more mature and balanced policy, featuring both military and civilian applications.

* In early 1980s, Deng Xiao-ping made known his practical, scaled-back view of the space program. He informed the Ministry of Seventh Machinery Industry (reorganized and transformed in 1982 into the Ministry of Astronautics Industry) that the space program must conform to society's larger goal of economic development. It should focus on developing satellites that would have economic value (e.g., in telecommunications and remote sensing) instead of sending rockets to the moon (Chen, 1991). Government support for the space program decreased.

* As a response to the inadequate funding from the central government, the space community identified two sources of funding: domestic and international. Space program factories devoted some of their capacity to producing consumer and industrial goods (Renmin Ribao, October 10, 1989). Income would also be generated through selling satellites and space launch services, a bold strategic move toward commercialization.

* A settlement with the U.S. government regarding the technical security and licensing requirements surrounding China's launch of U.S. made satellites.

China's first attempt to market its launch services proved successful following AsiaSat I on April 7, 1990.

* The Chinese government decided to develop a space station and earth-space transportation system.

4.1 The Satellite Technology in the Civilian Sector, Motivational Factors

The early 1980s marked the turning point for the Chinese satellite program. In the past, the military and civilian sectors operated on parallel tracks with relatively little crossover. The separation was particularly pronounced in sensitive high-tech areas like telecommunications and computers where military needs usually had the first call on research and development resources. Government policy changes and financial imperatives called for closer cooperation between the military and civilian industrial sectors, particularly in transferring military research results. Since the 1980s, technological spin-offs from the military research and development programs have been incorporated in civilian industries and have yielded tangible benefits in such areas as communications, earth resource surveys and meteorology.

For instance, Li (April 23, 1991) reported that 12 retrievable remote-sensing satellites had helped China to detect large coal deposits in the Inner Mongolia Autonomous Region and an oil field in Northwest China's Xinjiang Autonomous Region. Timely information relayed from China's weather satellite had reduced losses from typhoons, floods, fires and other disasters. The Fengyun-1 sent to space in September 1990 was believed to be capable of monitoring all typhoons in the northwestern Pacific area, and its information was shared by Taiwan, Japan, the U.S. and other countries and regions around the Pacific Rim.

Although China's experiments with communications satellite began in earnest in early 1980s, they can be traced back to 1978 when China used a Franco-German experimental satellite Symphonie to conduct transmission tests for telephone, television, facsimile and time-synchronization, as well as experimenting with teleconferencing. In 1982, an even wider transmission test was conducted by using an Intelsat transponder. China's first geosynchronous communications satellite (STW-1) was launched in 1984, followed by four telecommunications and broadcasting satellites launched in 1986, 1988 and 1990 respectively (see Appendix A). These satellites, along with leased capacity on Intelsat, were capable of transmitting television and radio programs from Beijing to all parts of the country, and providing the bulk of international telecommunications. Together, they lay down an initial technical base for practical domestic uses of satellite communication. Intelsat has been instrumental in China's effort to apply the satellite technology for communication purposes, as we shall see.

In 1985, the Chinese government reorganized the China Broadcast Satellite Corporation (CBCS), which was to be responsible for the construction and management of China's communications and broadcasting satellite systems. In the same year the "Leasing for Transition" program was initiated, in which transponders were leased or purchased from Intelsat, and other satellite owners as an interim measure. This enabled China to establish its operational domestic satellite communications system step by step and achieve the objective of using satellite communications as its main means of transmission for communication and television broadcasting.

The first phase of "Leasing for Transition" was to use Intelsat's transponders for a series of pilot experiments and demonstrations, and to aid the construction of ground networks and the manufacture of equipment. The second phase will rely mainly on communications satellites made and launched by China while using leased and purchased transponders as a complement, further expanding the uses of satellite communications and speeding up the construction of a terrestrial network. In the third phase, Chinese-made high-capacity communications satellites will be launched to form an operational domestic satellite communications system (Wu, 1988).

As the title of the program suggests the ultimate aim is to be self-reliant. This is in keeping with the overall strategic policy of technological autonomy. But the willingness on the part of the Chinese government to join in cooperative ventures with the world community demonstrates its flexibility as compared with its previous "no contact" posture. At this time of writing, China is in phase two with a combined capacity of 11 C-band transponders, four of which have a bandwidth of 72 MHz each, and the remaining seven have a bandwidth of 36 MHz each. These transponders serve telephone, telegraph, facsimile, and VSAT (very small aperture terminal) communications of MPT (Ministry of Posts and Telecommunications) and private satellite communications of Ministry of Oil, the State Meteorological Bureau, Ministry of Coal, the Banking Systems and the China International Trust and Investment Corporation, Beijing's major investment and finance company.

It is interesting to note how these individual ministries and enterprises will become major actors in the next decade or so pushing the application of communication satellites for dedicated data transmission and computer networks. However, while these institutions are encouraged to contribute their share to the satellite program by providing extra source of funding, they are not there to dismantle the monopoly of the government over the hardware and the software because they themselves are either a branch of the government or state-owned.

Meanwhile, China is taking steps to move into phase three. Renmin Ribao (1991) disclosed that a large-capacity 24-transponder communication satellite, "Dong Fang Hong 3," capable of covering all of China's land area and with a life expectancy of eight years is near completion. Feng Yun-2, an improved version of the first weather satellite, Feng Yun-1, is also in the making.

China is using satellite distribution to carry the T.V. University in addition to CCTV, the national television network. This is significant, because it is the first effort made to reach the grassroots level. According to Zhou Yougao (1986), CCTV used to be transmitted via microwave to major cities, but apparently satellite reception is of higher quality. To reach remote areas, CCTV previously had to record its programs and send videotapes by plane to local television stations in regions such as Tibet and Xinjiang in the western part of China where audience watched the programs three days late. In southern Xinjiang, with no civilian airports, programs were as much as 15 days late.

Hudson (1990) commended China for its participation in Project SHARE (Satellites for Health and Rural Education), sponsored by Intelsat between 1984-1987, as the first step in implementing a national TV University, which is now a well-established institution. The goal was to deliver university instruction to students at their workplace in order to ease the critical shortage of places for qualified students in China's universities. Courses were initially transmitted over the terrestrial network used for broadcast television, but much of the country was not covered by this system. Now more than 5,000 TVRO (television receive-only) terminals have been installed and the T.V. University has an estimated student body of more than one million. Li (1991) said transmission of television training courses, made possible by the satellites, had saved China about five billion yuan ($960 million) a year.

What are the motivating factors behind the move toward the application of satellite technology for communication purposes? National unity and cohesion, economic and socio-cultural reasons, among other things, seem to have dominated the decision making process.

China has a vast territory with varied topography: 80 per cent is mountainous land or desert. These geographic conditions have led to a very uneven distribution of population: the Han majority concentrates on the east coast while ethnic minorities are scattered around in the west, north and south along the border lines making up more than half of China's land areas. As a result of long-standing economic backwardness and geographic limitations, China's terrestrial communications encountered almost insurmountable difficulties, thus holding up social and economic development in the remote areas. For the same reason, the government had difficulty reaching the remote areas such as Tibet and Xinjiang, which had seen eruptions of violence which was partly attributable to the diversity of ethnic groups and languages and the lack of communication. The ethnic minority regions are also most susceptible to the "spillover" from foreign countries. Tibetan religious leader, Dalai Lama, who lives in India in exile, has never given up his effort to communicate with the secessionists in Tibet. National integrity is a perpetual problem that the Chinese government must confront.

On the other hand, the economic reforms and the "opening to the outside world" policy have given rise to a growing demand for information transmission. The demand is extremely acute in major coastal cities and "special economic zones" where commodity economy is well developed and international links are essential for trade and commerce. In the ten years between 1980-1990, there were five Special Economic Zones: Shenzhen, Zhuhai, Shantou, Xiamen and Hainan, and 14 designated open coastal cities including Shanghai and Guangzhou. These cities and regions have attracted more than 29,000 foreign-invested enterprises, including solely foreign funded, and Sinoforeign joint ventures or cooperative ventures with a total investment close to U.S. $19 billion (Rao, 1991). A study (Beijing Review, 1989) shows that China's use of telecommunications facilities per capita was 10 percent less than the world's average per capita consumption. Serious shortage of long distance telephone circuits has resulted in a low call completion rate. Lack of momentum in the construction of national transmission facilities on backbone routes has become a serious problem, leading to the hampered integrative capability of telecommunications networks. An outdated and saturated communications network has become a weak link holding up China's goal of attracting foreign investment and quadrupling the annual gross value of industrial and agricultural output by the end of the century.

Realizing the seriousness of the problem, the central government revised its policies placing posts and telecommunications on an equal par with energy and transportation in the national economy (Song, 1990). In March 1989, the central government reiterated that telecommunications is one of the key sectors in the development of national economy and that efforts should be focused on:

* growth of services such as local telephone, long-distance telephone and telex;

* construction of long-distance communications facilities and telecommunications hubs;
* application of new and high technologies, following closely the latest developments of new technologies in information communications;
* research and development of new technologies in communications; and
* local production of advanced systems for SPC (Stored Program Controlled) exchanges, mobile telephone, microwave, fibre-optic and satellite communications systems (Song, 1991).

The obvious advantages of the satellite in offering instantaneous point-to-point and point-to-multipoint communication irrespective of distance and terrain, coupled with the imperative need for information and communications services to build a sense of national unity out of what is a highly diverse mixture of cultures and nationalities and to achieve economic development goals compelled China to opt for communication satellites as well as other advanced communication technologies such as fiber optics (Song, 1990).

Hudson (1990) argues that the communication satellite holds dramatic promise for developing countries based on its ability to offer reliable communication -- both interactive telecommunications and broadcasting -- to virtually every community, small or large. After listing half a dozen advantages of the satellite technology in terms of economic growth as measured by gross domestic product and quality of life as indicated by the accessibility of education, health care, and other social services (p.168), Hudson went to great length to explain the importance of two-way communication in the sense that the centralized satellite broadcasting without a complementing telephone service not only deprives people of the means of getting the type of assistance that may not be available locally, but of the means of influencing their own development (p.180).

While it is true that the development of satellite technology has helped China to overcome the barriers of distance and diseconomies of reaching scattered population, the two-way communication, as described by Hudson is, at best, limited. The system's capacity in China appears to be devoted primarily to television transmission, and, the emphasis on television reflects importance the Chinese government attaches to disseminating official information rather than facilitating the exchange of information among individuals and organizations, a function more prevalent in democratic societies and market oriented economies.

If it can be agreed upon that satellite communications is closely associated with specific types of political and power configuration, then it is easy to determine the impact of the diffusion of technological innovation, whether it contributes to conformity or diversity; more control or more autonomy; more efficient bureaucracy or more "universal service."

In comparison with the market economies, the Chinese system features a very simple mode of financing the communication satellites: the money is provided by the government and the satellite is viewed as an important part of the apparatus of governance. The social applications of the satellite technology in China, in terms of provision of health services and farming techniques for the rural peasants, are yet to be seen. The lack of commitment in this area seems to be generic in Third World countries whose priorities are very often other than what the western communication and development scholars anticipated. This phenomenon leads McAnany and Nettleton (1987) to conclude that a variety of internal and external, and structural reasons often prevent well-intentioned efforts to use a technology like satellites for social applications, even when there are obvious needs and real potential benefit. Only when there is a political consensus, backed by budgetary support, says McAnany and Nettleton, are social applications likely to succeed. It is a misguided hope that the mere presence of the technology will promote such an outcome.

4.2 Commercialization of "Long March" Launching Services, Emergence of Foreign Actors

China's most successful area in satellite industry lies in the carrier rocket technology. Using its growing family of Long March series (see Appendix B), China has launched 30 satellites (See Appendix A), with a high success rate of 93 percent, a rate better than that found in carrier rockets abroad (Xu, 1990).

Worth mentioning is Long March-3 the three-stage rocket, which has become the centerpiece of the Chinese launch service. Its first and second stage boosters were improved on the basis of China's long-distance carrier rocket. Its third stage booster adopted the crucial rocket technology of hydro-oxygen and hydro-hydrogen, high-energy, low-temperature fuel rocket. The technique, by which a 3-stage rocket can be started twice under zero gravity of space and a high vacuum, marked a breakthrough in overcoming the orbit control difficulties previously faced when launching earth stationary orbit satellite at a place far removed from the equator. The rocket and its larger cousins, the Long March-2 and the Long March-4, could serve as boosters for small manned space vehicles (Kohler, 1989; Xu, 1990).

A relatively new version of the Long March-2 can use the American PAM-D solid rocket that has been used to boost comsats toward Clarke orbit from the space shuttle, while an uprated Long March-4 is suitable for different satellite launch sites and launching different types of applied satellites and scientific and technological experimental satellites into different orbits.

In July 1990, the Long March-2 cluster carrier, a newly developed high-capacity booster rocket, was successfully launched at Xichang Launch Site in southwest China. The launch has added new dimension to China's carrier rocket series and is an indicator of China's ability to launch heavy satellites. Similar to using an aircraft to launch a satellite, the Long March-2 cluster rocket first pushes the upper stage rocket and satellite to the near-earth orbit where it then ignites the upper stage rocket and, in a "relay," sends the 2.5 - 3.2 ton (5,000 - 6,400 pounds) heavy communications satellite to the geosynchronous transfer orbit 36,000 km high. If a mixture of hydrogen and oxygen is used for the upper stage, it is capable of pushing a 4.5 ton (9,000 pounds) satellite to the geosynchronous transfer orbit. The development of the above rockets placed China among the ranks of those countries with the ability to launch satellites into near-earth orbit and simultaneous synchronous sun and earth static orbit.

As a result of the changing political and economic climate at home and abroad, and as profit-making is no longer labeled as a capitalist, bourgeois practice, the country began to take steps to restructure the space enterprise into a profit-making center. In 1985, with the founding of Great Wall Industrial Corp., the marketing arm of the ministry of Aeronautics Industry, China began a global campaign to commercialize the satellite launch services on its Long March boosters, and other services such as the manufacturing of small and medium-sized satellites, payloads launched aboard recoverable spacecraft, and environmental-simulation testing. The newest launch site at Xichang in Sichuan Province was built with growth in mind. Facilities could be easily expanded or have already been designed to accommodate larger vehicles. In 1987, the Great Wall Industry Corporation signed a contract appointing a U.S. trade service company, Becker and Associates of McLean in Virginia, as commercial launch marketing agent for the U.S., the Middle East, and Latin America. Two years later, the Great Wall took over the responsibilities assigned to Becker and set up its own office in Los Angeles. The office provides consultancy services related to satellite launch services and seeks to import U.S. technology for China's space program (according to a telephone interview with Engineer Huang Zuo-yi, Great Wall Industry Corporation's chief representative in the U.S. on November 8, 1991).

~~The startling chain of~~ American and European rocket failures in 1986 enabled China to gain momentum in the race for the multi-billion-dollar launch services market.

China's competitive edge lies in its low prices, about 10-15 percent below the rates of NASA and Ariane according to Chinese official estimates (Rhea, 1986), the ability to custom-fit the rocket to a client's payload, guaranteed availability of launch insurance, and an impressive success rate of launches.

In its first strike at the lucrative business of sending payloads into space for profit, China successfully launched a telecommunications satellite made by the Hughes Aircraft Co. of the United States on April 7, 1990. The satellite, named Asiasat 1, belongs to Asia Satellite Telecommunications Co., a private consortium owned equally by the British Cable and Wireless Co., the Beijing-based, state-run China International Trust and Investment Corp., and Hong Kong's Hutchison Whampoa Group. The satellite relays messages, mostly commercial television, across Asia, covering a swath from Saudi Arabia to Indonesia to Japan. The Great Wall Corporation of China has so far won the bid to launch an experimental satellite for Sweden (Huang). Also from 1991 to 1992, China is scheduled to launch two additional U.S.-made communications satellites for an Australian satellite company. The Great Wall Industry Corporation's chief representative, Mr. Huang, said the Connecticut-based Alpha Lyracom Communications has expressed interest in having the Great Wall launch three of its communication satellites between 1993 and 1995. These satellites are expected to be carried on the modified Long March-2 or Long March-3 rockets (Kohler, 1989). Pike (1991) of Australia's Spacecraft Procurement, Aussat Pty. Ltd. has recorded in great detail the aspects of the Chinese space program of interest to potential users of Chinese commercial launch services. The Bush administration had previously suspended the export licenses for the Hughes satellites following the 1989 military crackdown in Beijing on the pro-democracy movement. Five months later, Washington lifted the ban, thus removing the hurdle for the above-mentioned contracts with Australia to be implemented. Whether the U.S. government is going to grant China export licenses for the Alpha Lyracom Communications' satellites still remains questionable.

A further sign of the open-door policy, China has sought joint ventures with the United States, Germany (or, West Germany as it was then called), France, Italy, Brazil and Indonesia in space technology. In 1986, the Chinese Ministry of Astronautics signed an accord with the European Space Agency under which the two sides would cooperate in future space enterprises, including a manned space shuttle (New York Times, September 2, 1986). In August 1988, a West German payload that explored the growth of protein crystals in space hitchhiked aboard another Chinese satellite that also was successfully recovered. Brazil's Avibras Aerospacial and the China Great Wall Industry Corp have formed a joint cooperation specializing in communications satellite launching, tracking and networking (Kolcum, 1989). The Chinese authorities have proposed cooperation with Singapore on construction of an $800-million launch site in Indonesia (Rao, 1988). If successful, the Chinese-Indonesian project will represent the first joint effort in space by two Third World nations. Launching from Indonesia close to the equator enables satellites to be moved straight into synchronous orbit, which saves fuel and thus offers the possibility of larger payloads.

What does China's entry into the international satellite launching business and the cooperative efforts with foreign countries in space technology mean, and what impact do they have on China and the rest of the world? There is an apparent need in China to recoup the staggering investment in its 25-year-old space ventures (Rao, 1985). The policies of economic reforms and opening to the outside world encourage the entrepreneurial spirit and profit-making to the extent that they do not conflict the government's overall planning and strategic considerations. Profitability has thus become an important criterium in the decision making process. From China's perspective, two to three extra launch missions added to the domestic annual launch schedule of only two or three missions can provide China with the much needed hard currency to boost and upgrade its own satellite program and simultaneously raise

China's stature in international technological circles (Covault, 1987).

Much remains to be seen whether China can launch satellites fast enough to attract significant commercial satellite business. However, the world's major launching providers, the European Ariane and the U.S. in particular, already see the Chinese presence in the field as a threat. Western analysts believe that the Chinese government is subsidizing launches on the Long March series. Perry (1990) argues that since China is offering to send up payloads for $20 million to $30 million -- less than half the price their American competitors charge, this is likely to put the west out of business. About 15 to 20 commercial satellite launches are required annually world-wide. About half of them are handled by Arianespace. "If another four satellites were to be launched by China," says Kohler (1989, p.66), "six or fewer satellites would be left to the three American companies (Martin Marietta Co., McDonnell Douglas Corp. and General Dynamics). So little traffic could lead one or possibly two of the American companies to quit the business."

In January 1989, the United States signed a trade agreement with China providing the U.S-made comsat export licenses. In return, China agreed to launch no more than nine international comsats through 1994 and to maintain launch prices on a par with world markets instead of subsidizing launch services. The Fact Sheet on the Memorandum of Agreement Between the US and PRC Regarding International Trade in Commercial Launch Services (1989) addresses the issues related to international competition between market and non-market economies, technical security and U.S. government licensing requirements. The constraints and restraints aside, if China is able to sign up nine customers through 1994, it will earn as much as $500 million in business that would have gone to the U.S. launching companies or to Arianespace. While the Sino-U.S. agreement limits the impact of Chinese competition on the U.S. commercial launch industry, it also recognizes China's position in the international space market (Covault, 1989).

In responding to the western misgivings about China's "dumping" on the international marketplace, the Chinese government has reiterated its own position (Beijing Review, May-21-27, 1990): China's development of carrier rocket technology is primarily intended at meeting its domestic modernization needs, and, at the same time, if it has surplus capability, to provide commercial services for the world market. As to the quoted price for commercial launching services, the explanation is that the Chinese carrier rockets are practical and reliable, have a high rate of success and use all domestically made materials and components. Moreover, China's labor cost is low. In sum, China will not quote a price lower than its actual cost, and the government will not subsidize the business. While China and the U.S. and other western countries are working to resolve their disagreements on international competition, China's joining the launching service may ultimately bring the price down, thus making the satellite a more affordable technology.

4.3 Space Station, National Ambition

With additional three launches on the Chinese launch book, it does seem that the prospects are good for China in the multi-billion dollar business. China is badly in need of foreign exchange in order to import modern technologies and expertise, and also to make Chinese products more competitive in the world market. It should be remembered that, despite progress in the satellite industry, China's basic telecommunication facilities are out-dated. Nationwide telephone density is only 0.75 per 100 population. In the rural areas the density falls to 0.17. Both figures are well below the developing world's average density of three telephones for every 100 (Zita, 1989, p.18). The most sensible satellite program, it seems, would be one that concentrated on replacing and improving China's satellites for communication purposes. That way China might get a telephone system that works and, with the help of earth observation satellites, find out more about the country's natural resources. A less sensible program would be to plan a manned shuttle and a space station, just like America. That, however, is precisely the dream outlined by the Chinese Ministry of Astronautics Industry in 1989 (Far Eastern Economic Review, 1990). The major proponents of this ambitious project are a group of scientists who were called upon by Deng Xiao-ping and the then premier Zhao Zi-yang to identify which high-technology field should be emphasized. The group issued in March 1986 what came to be known as the "863 Proposal", denoting the year and month it was issued (Chen, 1991). The proposal listed seven areas in which China should develop strong capabilities in order to guarantee future economic progress: biological engineering, space technology, information technology, laser technology, automation technology, energy and new materials technology. The proposal was debated among the science and technology community and the space program came out well and was later endorsed by the central government, thus laying out the future direction of the space program. Its long-term goal is threefold:

* to build a space station;
* to develop a heavy launch vehicle;
* to develop a space transportation system.

It is not clear how such an enormous undertaking can be financed, given China's limited resources. The reasons behind the proposal have not been well articulated, or at least not publicized. It appears that all the important factors that influenced China to embark on space activities in the first place: the national prestige, the geopolitical and military realities of Soviet and American space race with two thirds of their space launchings serving military purposes, and the desire to play "catch up" again seem to be tipping the scale. Already work is under way on manned spacecraft design at the National University of Defense Technology in Changsha. Meanwhile, Beijing Institute of Space Medicine and Engineering is developing space suits for high-altitude aircraft and for space flight (Kohler, 1989). These activities coupled with the ongoing effort to further improve the Long March launchers led Tu (1988) of China's Ministry of Astronautics to believe that China can develop the technology that is necessary to design a space station and Earth-space transportation system. The Chinese People's Liberation Army still controls large elements of the space program and operates key facilities, such as the launch site, and has the greatest base of experience for launch vehicles. The direction in which the army will orient space program development will have decisive effect in the next decade or so. The dream of a space station and space shuttle may very well come true by the end of the this century, but "universal service" probably has to take a back seat.

The following is a matrix (Figure 3) illustrating the major factors and actors influencing the development of the Chinese satellite program from early 1980s on. It is interesting to note the emergence of economic factors at all of the three levels: foreign, national and subnational. With China's increasing contact with the outside world, new actors such as the U.S. government and numerous other satellite using countries, U.S. and European launchers, Intelsat, and the Great Wall Corporation are becoming more and more active in influencing China's satellite program and related policies.

However, the central ~~role of the Chinese government~~ is still undisputable. The introduction of economic factors and the emergence of the above-mentioned actors are essentially the workings of the high-level decision makers in response to the overall global and domestic situations. It appears that geopolitics continues to exert its influence, while economic reasons have become one of the primary movers pushing the satellite program. Evidences have shown that the nationalistic and propagandistic fervor has become a thing of the past, but the desire to play "catch up" is still strong.

	Economic	Scientific/ Technological	Political/ Geopolitical	Cultural
Foreign	US & European launchers exerting pressure	Joint programs in space with the west & Third World & Intelsat	end of Cold War; Bush Administration; Space race	
National	launch service commercialized for profit; communication satellite for economic activities	Lease for Transition; Ministry of Astronautics & China B'casting Satellite Corp "863" Proposal	prestige; national unity; geography; disemination of official information; government support	desire to play "catch up";
Sub-National	growing demand for communication in economic zones on east coast.		ethnic minority issues;	to promote cultural & linguistic unity

Figure 3

Matrix of Illustrative Factors/Actors Influencing the Chinese Satellite Program (1980-91)

CHAPTER 5

CONCLUSIONS

Despite the ups and down of political, economic, and social events in China and despite the country's limited financial resources, support for the satellite program has remained remarkably stable. A historical and contextual analysis shows how national strategic considerations, i.e., geopolitics, national security, cultural and prestige reasons, dominate the decision-making process at the highest levels of the Chinese government. It also reveals how and why China's satellite program has evolved since the early 1980s when increased economic activities and international cooperations began to change what was basically a military undertaking into one that has both civilian and military applications with the civilian side steadily gaining ground. The prominence of geopolitics and national security factors in China's satellite program stands in contrast with other Third World countries who are exposed and influenced by different contextual factors and actors, and different sequence of events, but it makes sense in the context of China's history, the international situation surrounding

China, its cultural tradition and its political reality. In China, the monopoly structure and central planning enable the concentration of resources for the satellite program, but this may not be conceivable in countries like India, or Mexico, which features a democratic political system and a mixed economy. Therefore, one must avoid making sweeping generalizations. As Mody aptly put it, "to make generalizations in terms of Third World countries is to think in unwarranted superficial generalities." (1987, p.157)

In China, policy decision power resides in the highest level of the central government. Taking national strategic considerations into account and influenced by the global situation in general and China's relationship with the two superpowers in particular, the Chinese leadership has adjusted its policies governing the satellite program, as has been demonstrated in Phase Two beginning in the early 1980s. With the conclusion of the Cold War era followed by negotiations between the United States and the Soviet Union that have led to concrete actions of arms reduction, and with the recent changes in the political, ideological and economic landscape of the entire world, it appears that China has to adapt itself. Policy changes are inevitable. Will China reevaluate and reorient its satellite program so as to expand telecommunication services, improve productivity and enhance development in education and health and other spheres? Will Current efforts to introduce advanced western technologies and joint ventures in space create an dependent relationship, as has happened to Mexico? Will China maintain the policy of self-reliance as Premier Li Peng vowed to the space scientists following the negative international reactions to the crackdown on democracy movement in Tiananmen Square in 1989 (FBIS, 1989)? The next decade or so will show whether the current prevailing conditions will continue to favor the satellite technology being utilized for the civilian sector and for social applications, and whether China will become increasingly reliant on or more detached from western technologies. Further studies are in order.

The implications for communication researchers are: 1.) A traditional study of the effects of a certain communication technology and the variables that explain why individuals are affected or not affected by communication content of some specific nature would have yielded no insights for Third World policy makers; 2.) "Extra-(neous)communication variables" (Mody, 1987) such as power structures, indigenous belief systems and political ideologies, are closely related to the control of social and economic resources, and communication decisions. These broad issues must be addressed if communication is to produce desired effects. As China's case shows, the centrality of the state government as a formal decision maker and goal setter means that effective communication is as much a matter of state policies and politics as of technologies and terminals; 3.) In examining and analyzing a given communication policy or a given information technology in a given Third World country, one has to be aware that the factors and actors influencing that policy or technology interact to varying degrees, and that the nature and extent of interaction varies over time, some elements waxing and waning in influence, others such as the political and cultural philosophies and motives, remaining quite stable, and 4.) The emphasis on both internal and external context means that one should not adopt a deterministic perspective. The contradictions and conflicts between the different forces in the field of satellite communication are the locations where hopeful interventions and changes are conceivable.

For development planners, each space-faring Third World country or group of countries offers a different approach to developing satellite capabilities. The Chinese satellite program has been and still is predominantly an independent research and development effort while cooperations with western countries are being encouraged to augment what is basically an integral program. The level of development in China is uneven with the launching system surpassing communication satellite technology and earth stations, and the human cost involved may be too great at times to entice other Third World countries to follow suit. In India and Brazil, although reliance is still placed on foreign contractors in the absence of their own launch facilities, the transfer of foreign satellite technologies translated into more than 20 years of assimilation and the gradual adaptation towards indigenous expertise (Mody & Borrego, 1991). The Arab countries, Indonesia and Mexico, on the other hand, purchased off-the-shelf technologies resulting in a shorter decision making cycle but long term acceptance of foreign services. Together the various approaches offer useful lessons and serve as a valuable reference for all of the satellite using Third World countries as well as for those who are contemplating on space communication.

APPENDICES

Appendix B

Chinese Space Boosters

Type	Stages	Launch Mass	Payload/Remarks
CZ-1	3	89.7 tons	660 lbs. to 265 mi. circ.
(1970)			Solid-fueled 3rd stage
CZ-1C	3	96.8 tons	880 lbs. to 350 mi. circ.
(1986)			Liquid-fueled 3rd stage
CZ-1M	3		Lengthened
CZ-2	2	212.3 tons	3.3 tons to 240 mi. circ.
(1974)			
CZ2C-MSM	2		Multi-satellite mission
(1981)			capability
CZ-2C-OTM	2+Orbital transfer module		
CZ-2D-Pam-D	2+U.S. Pam-D		1.9 tons to GEO
CZ-2E	2+ 165 ft.		9.5 tons to LEO
(1990)	4 strap-ons		Stretched 2nd stage
CZ-3	3	218.5 tons	1.5 tons to GEO
(1984)	3+ 170 ft.		
CZ-3A			
(1992)	strap-ons		2.75 tons to GEO
CZ-4	3		2.7 tons to SSO
(1988)			
CZ-4L	3+4 strap-ons		5.8 tons to GEO
(1991)			

Source: Vincent D. Kohler, "China's New Long March" in Analog Science Fiction Science Fact, Dec. 1989

CZ = Long March

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