REVISED FY 1976 AND FY 197T FINANCIAL PROGRAMS AND
FY 1977-1981 BUDGET AND PLANNING ESTIMATES

PROGRAM 989

1. Program Description

A. Baseline Program

The Baseline Program supports the start of one new payload every 18 - 24 months and meets the program funding levels for FY 1976, FY 197T and FY 1977 approved by the July 1975 EXCOM. Delay in the go-ahead decision has resulted in a $2M cost increase of RAQUEL II in FY 1977 due to a 10 month launch delay and costs associated with attempting to hold to a December 1977 RAQUEL II launch availability. The start of URSALA V was delayed to hold the FY 1977 requirement to the approved level. FY 1981 costs have increased because of the need to start RAQUEL IV to hold a 1983 launch date. The cost of each satellite is shown separately; however, the [redacted] 25X1

The HEXAGON Vehicle launch schedule of one per year after 1977 will require timely approval of new missions to avoid launch delays and associated cost increases of one-time missions, such as RAQUEL II. Also, it will require dual P-989 satellite launches, or launches earlier than needed, to preclude high probability of on-orbit gaps in the URSALA Mission.

The Baseline Program places emphasis on technical intelligence--precise radar main beam power, polarization, and parameter measurement--and also continues the URSALA series for general search, EOB, and operational support missions.

As shown on the Baseline schedule, three RAQUEL Technical Intelligence missions are planned by July 1983 to fully cover the frequency range of 0.1 to 18 GHz. The missions are RAQUEL II (1.5 - 10 GHz), RAQUEL III (0.1 - 1.5 GHz), and RAQUEL IV (10 - 18 GHz).

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The Baseline Program near-term work includes (1) the continued development of RAQUEL II, (2) the system revalidation testing, flight readiness preparation and launch of URSALA III in the Summer of 1976, (3) the Spread Spectrum Pallet Missions, and (4) minicomputer software development. The Baseline and all Alternatives continue the [redacted] at the NRO funding level approved by the July 1975 EXCOM. 25X1

To avoid the increased cost of a dual launch in 1978 and the high probability of an URSALA gap associated with delaying URSALA IV launch to September 1979, we plan to launch URSALA IV in October 1977.

This program provides high probability of continuous coverage in the 2 - 12 GHz region; however, probability of continuous coverage in the 12 - 18 GHz region is poor. The procurement of an URSALA V (2 - 18 GHz) in FY 1978 is also planned and will provide a 0.811 average availability of having at least one operational URSALA on-orbit through CY 1981. The probability of RAQUEL I living to cover 12 - 18 GHz until URSALA V is available in July 1979 is 0.02. The average availability of having an operational satellite on-orbit to cover 12 - 18 GHz through CY 1981 is 0.529. The average URSALA gap is 7.6 months while the average 12 - 18 GHz gap is 24.6 months.

RAQUEL II, III, and IV will have low sensitivity and narrow instantaneous bandwidths consistent with a main beam mission. They will, therefore, be poor search vehicles and are not included in any availability calculations.

The Spread spectrum program effort for FY 76 and FY 7T includes fabrication and testing of the flight model payload and antenna system and work on the ground processing system including the mission planning and command generation software. The FY 77 effort will integrate and test the payload and antenna system with the pallet and the HEXAGON vehicle.

Alternative One differs from the Baseline by modifying URSALA IV to operate from 4 - 18 GHz and delaying other new starts by about one year. Alternative Two provides RAQUEL IA and then continues with RAQUEL II, III, IV, and URSALA V. Alternative Three provides RAQUEL IA and a reassessment of the Program direction to define low cost missions complementary to the other overhead systems.

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B. Alternative One

Alternative One supports one new start every 24 months and meets the August 1975 EXCOM approved program through FY 77. This Alternative continues RAQUEL II and the Baseline Program, but provides for a frequency extension retrofit of URSALA IV and delays the start of URSALA V, RAQUEL III, and RAQUEL IV. The retrofit of URSALA IV will change the frequency range from 2 - 12 GHz to 4 - 18 GHz. This Alternative results in both URSALA IV Retrofit and RAQUEL II being available for launch in September 1978. Since the probability of RAQUEL I lasting until September 1978 is 0.1, and since delay of RAQUEL II until September 1979 would be undesirable, the Program Support line in FY 1977 and FY 1978 has been increased to provide a dual launch capability in September 1978.

Alternative One also includes the system revalidation testing, flight readiness preparation and launch of URSALA III in the Summer of 1976 and start of the Spread Spectrum Pallet mission for launch in December 1977. Alternative One provides high availability of coverage of 2 - 12 GHz but only slightly improves coverage of 12 - 18 GHz. Retrofit of URSALA IV (4 - 18 GHz) will provide coverage of the 12 - 18 GHz search mission after RAQUEL I dies; however, there will be an URSALA launch availability gap during retrofit. Procurement of an URSALA (2 - 18 GHz) provides a 0.804 average availability of having at least one operational URSALA on-orbit through CY 1981 and results in a 0.548 average availability of 12 - 18 GHz coverage through CY 1981. The average URSALA gap is 7.2 months while the average 12 - 18 GHz gap is 25.8 months. This Alternative delays the launch of RAQUEL IV until September 1984.

C. Alternative Two

Alternative Two meets the August 1975 EXCOM funding for FY 1976 and FY 197T, but exceeds it for the following years. This Alternative delays RAQUEL II until after RAQUEL IA is built and then continues the URSALA series and RAQUEL III and IV. Additional funding is required in FY 1977 to preclude the RAQUEL II launch slipping from September 1979 to September 1980. This Alternative shows that complex RAQUEL and URSALA V missions cannot be built even starting 24 months apart unless out year funding levels are increased to keep pace with expected cost growth. Near term effort in this Alternative includes test and launch of URSALA III in the Summer of 1976 and test and launch of URSALA IV in late 1978. The Spread Spectrum Pallet mission is also included.

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RAQUEL IA and an URSALA V will provide 0.604 average availability of having one satellite on-orbit through 1981 to cover 12 - 18 GHz. This Alternative also provides 0.72 average availability of having one operational URSALA on-orbit through CY 1981. The average URSALA gap will be 10.9 months while the average 10 - 18 GHz gap will be 18.8 months.

D. Alternative Three

Alternative Three meets the August 1975 EXCOM funding through FY 78 by changing near term mission emphasis and by reorienting outyear procurement to lower cost missions. RAQUEL IA is built as a replacement for RAQUEL I and RAQUEL II is terminated. Near term work includes system revalidation testing, flight readiness preparation and launch of URSALA III in the Summer of 1976 and URSALA IV in 1978. The Spread Spectrum Pallet mission is also included. The Alternative recognizes a major study effort currently underway in Program A. Missions will be selected to provide support complementary to other overhead systems. For example, the main beam power measurement, polarization determination mission will be reevaluated to consider a low orbiting satellite 25X1

Search mission selection will be directed toward those requirements for which P-989 satellites are particularly well suited, such as (1) CW emitter search, (2) exotic emitter search, (3) low power emitter search, (4) moving emitter search, and (5) search in frequency bands and over geographic areas not covered by other systems. Missions which are best suited for the Pallet will also be identified. The objectives and approach for this study effort are being defined, and our recommendations will be submitted for consideration by the July 1976 meeting of the EXCOM.

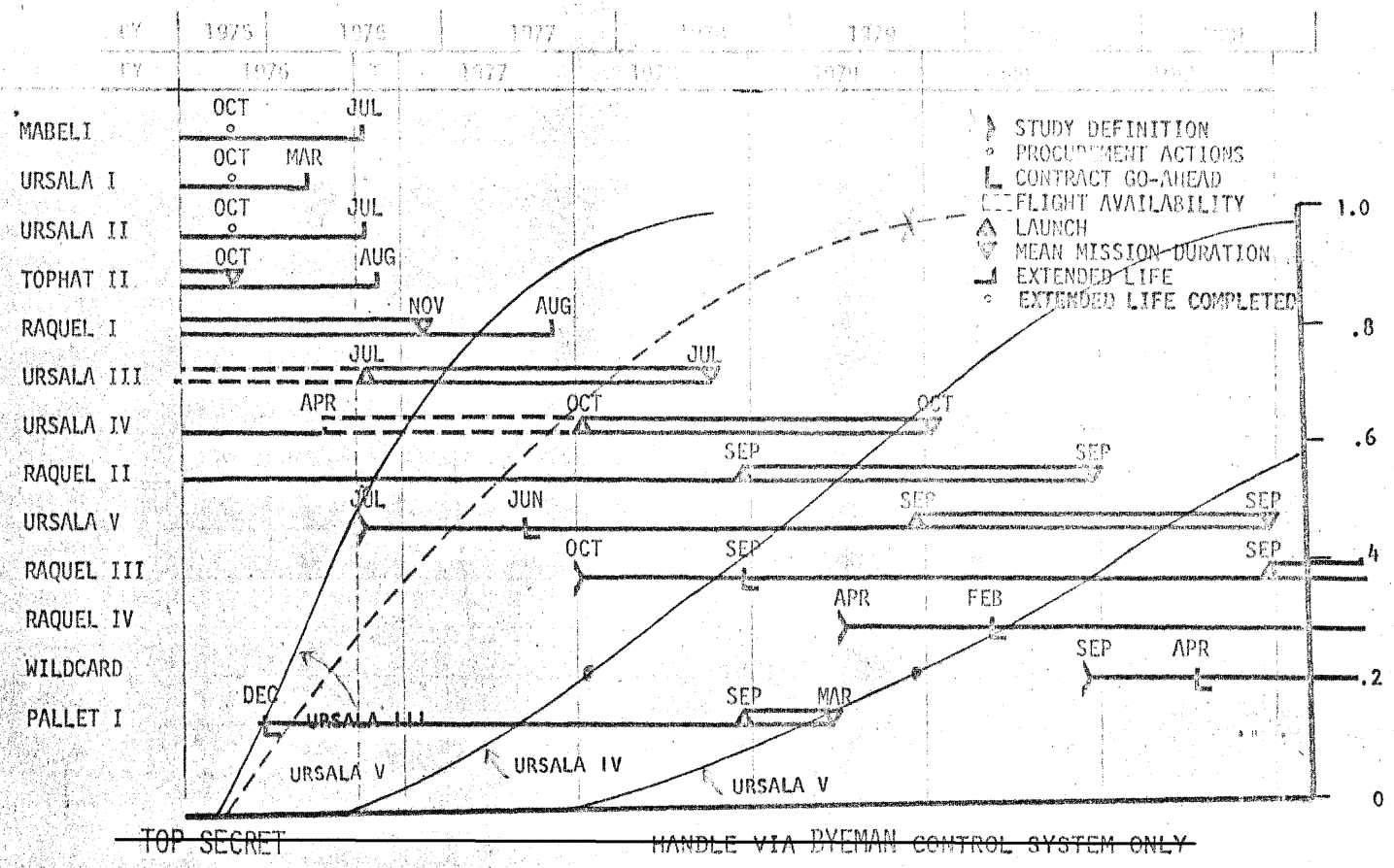
If study shows that it is desirable for the TI Satellite I to perform the URSALA 4 - 18 GHz search mission, in addition to specialized technical intelligence functions, there could be an average availability of URSALA type of coverage through 1981 of 0.733. The average gap in URSALA coverage is 7.1 months, and in 12 - 18 GHz coverage it is 11.2 months.

E. Option One: 18 - 42 GHz Sigint Pallet Payload

The objective of this effort is to design, develop and fabricate an 18 - 42 GHz receiver to fly on the HEXAGON pallet in September 1978. The FY 1976 program entails the design and development of the EHF Collection receiver and the design of the vehicle interface and antenna positioning system. Follow-on effort will involve the integration, testing and data handling plan. The costs for this Option are:

FY	76	7T	77	78	TOTAL
	1.4	2.6	4.1	1.0	9.1

2. LAUNCH AVAILABILITY AND MILESTONES P-989 BASELINE



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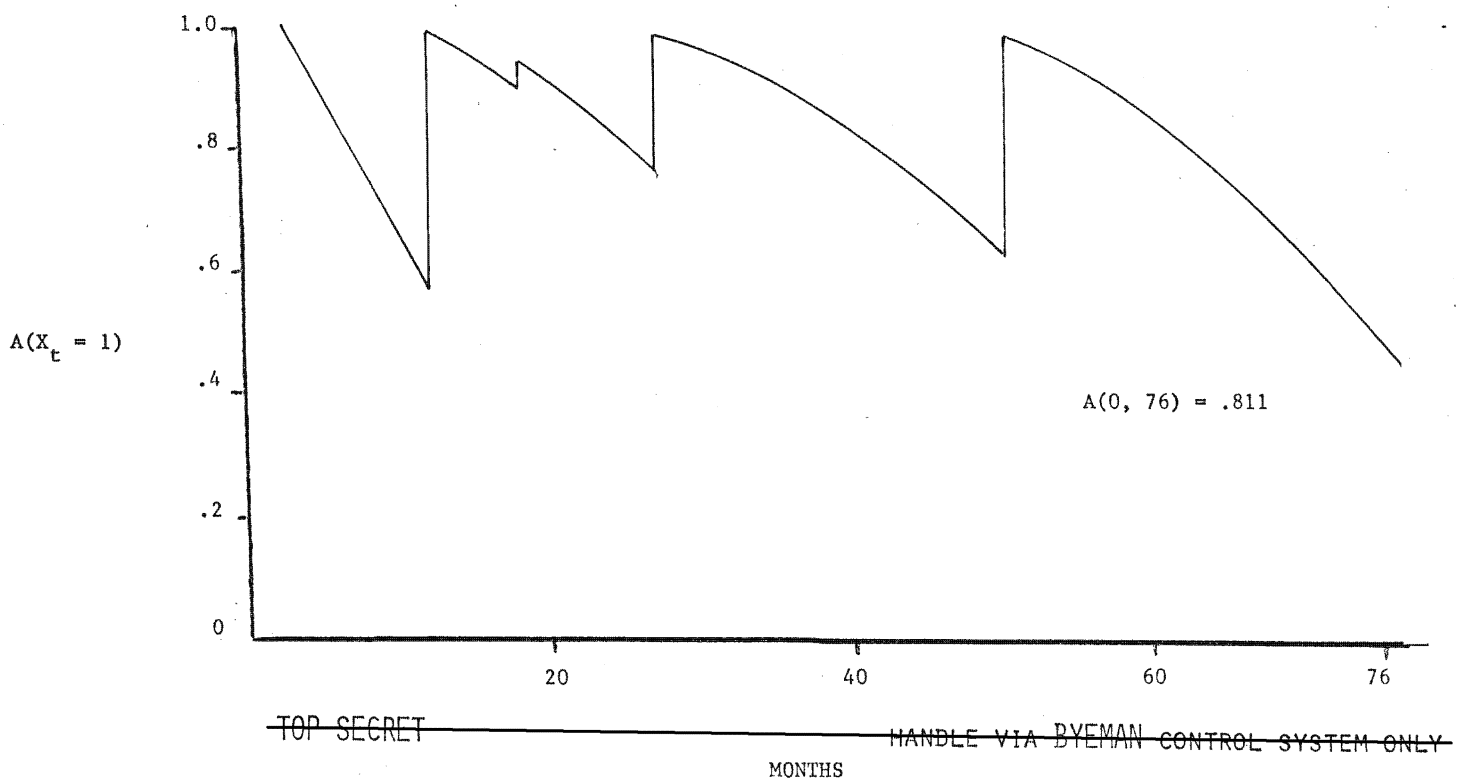
2. LAUNCH AVAILABILITY AND MILESTONES

BASELINE (URSALA)



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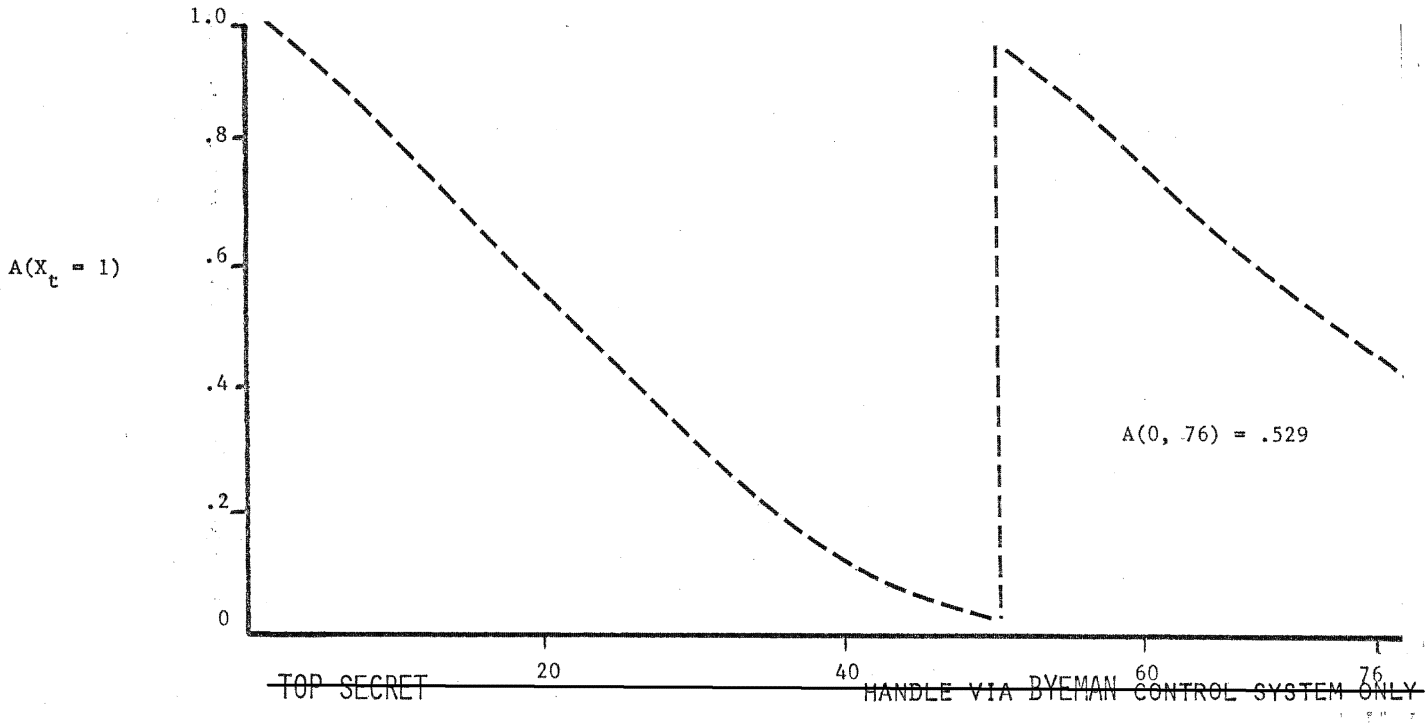
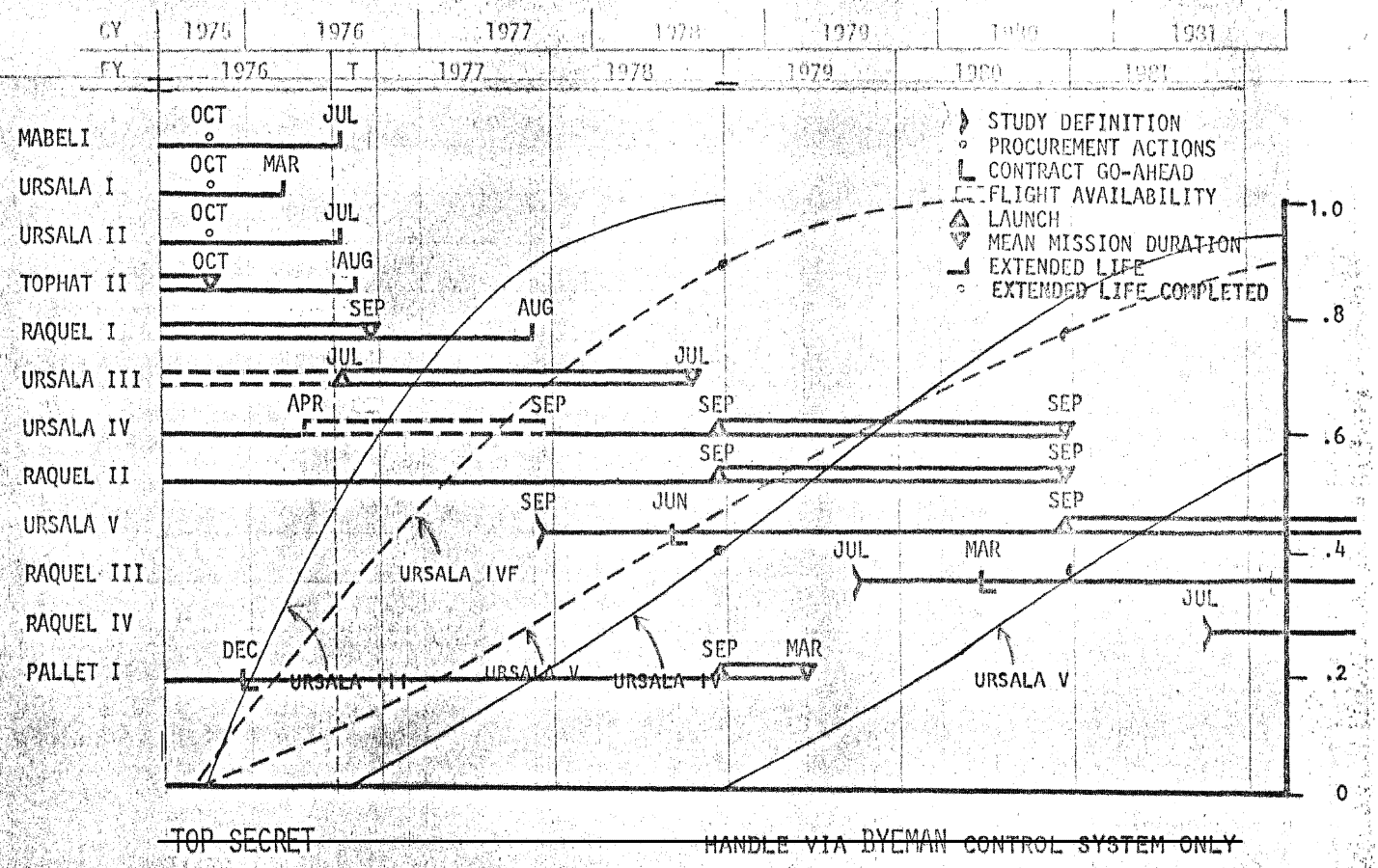
2. LAUNCH AVAILABILITY AND MILESTONES

POINT AVAILABILITY FUNCTION - BASELINE (12-18 GHz)



2. LAUNCH AVAILABILITY AND MILESTONES

P-989
ALTERNATIVE I



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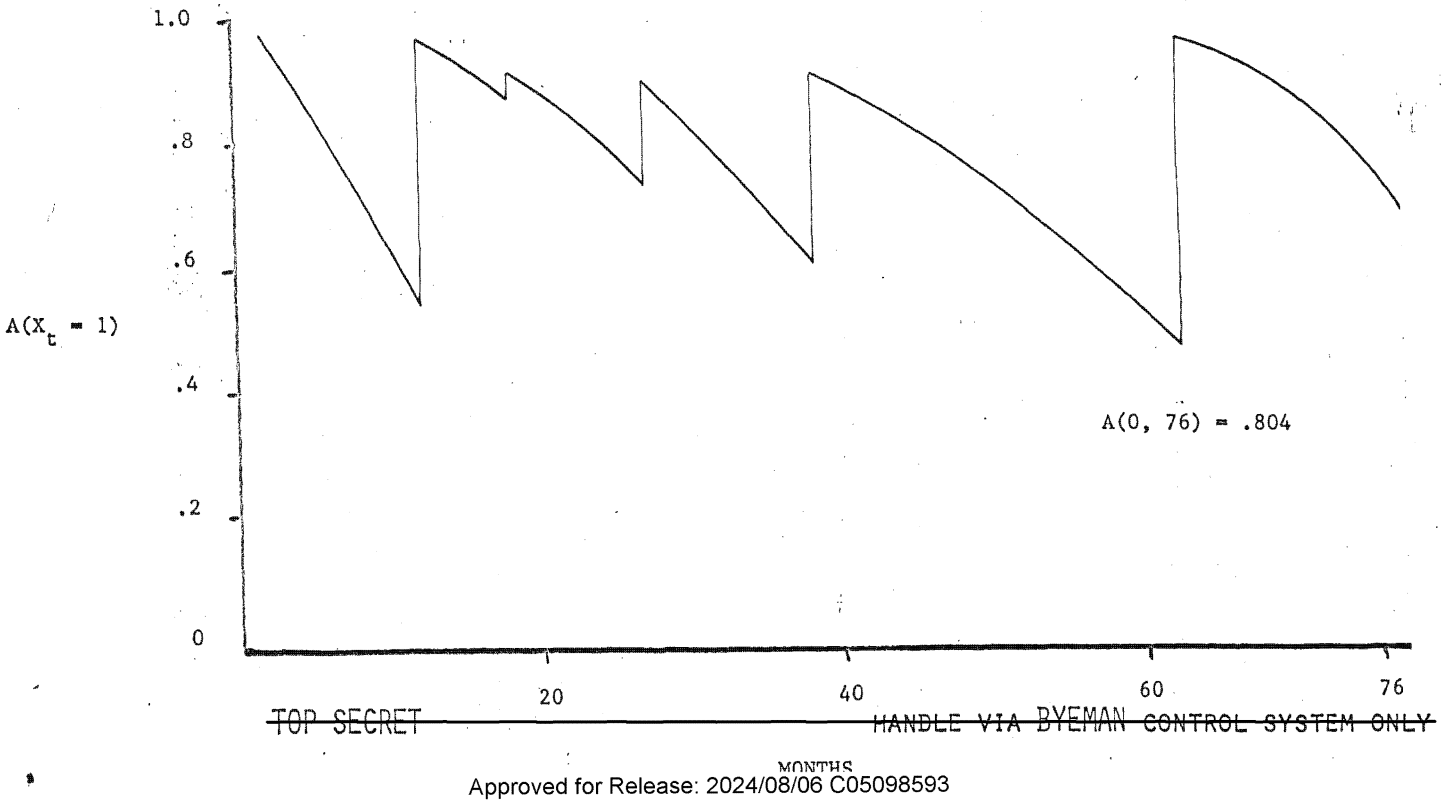
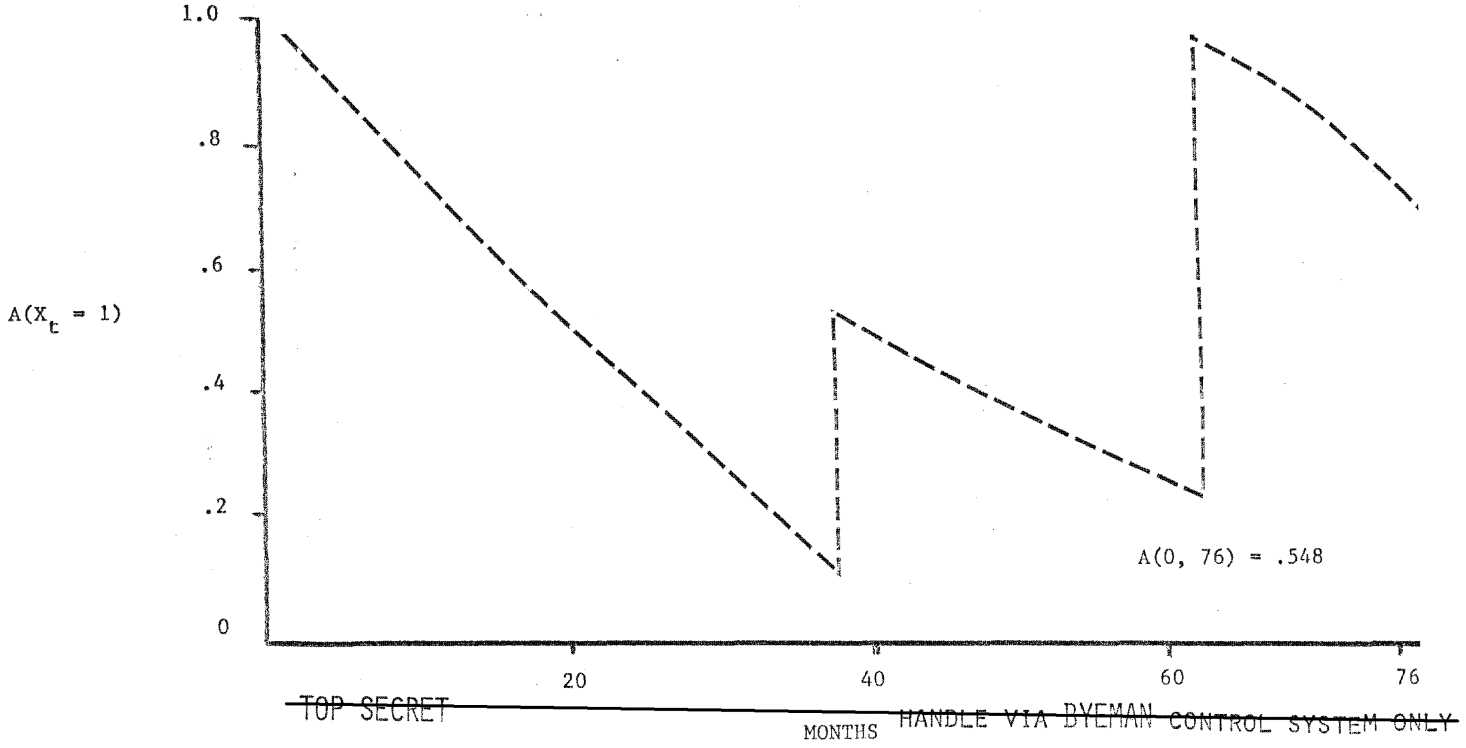
2. LAUNCH AVAILABILITY AND MILESTONES

ALTERNATIVE I (URSALA)



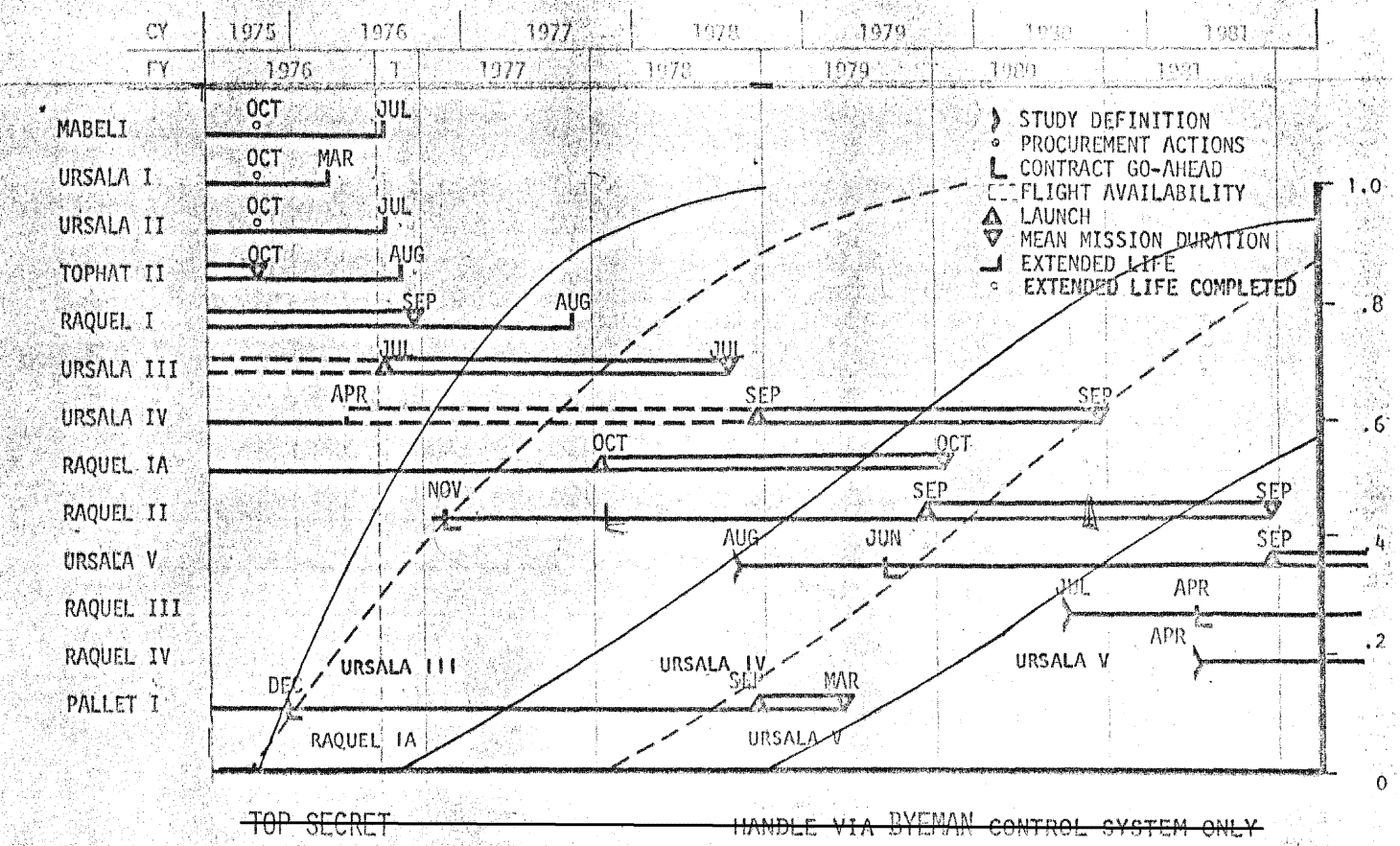
2. LAUNCH AVAILABILITY AND MILESTONES

POINT AVAILABILITY FUNCTION - ALTERNATIVE I (12-18 GHz)



2. LAUNCH AVAILABILITY AND MILESTONES

P-989
ALTERNATIVE II



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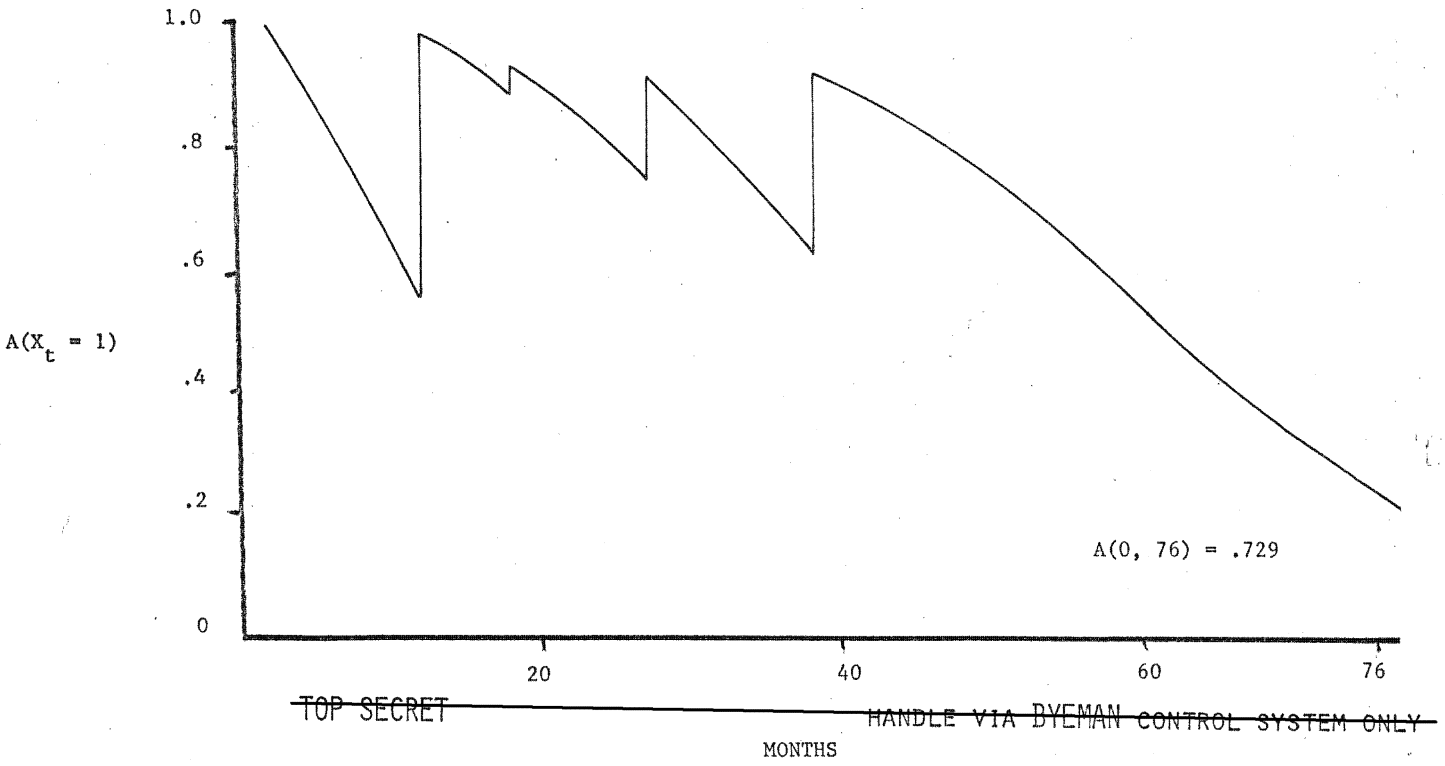
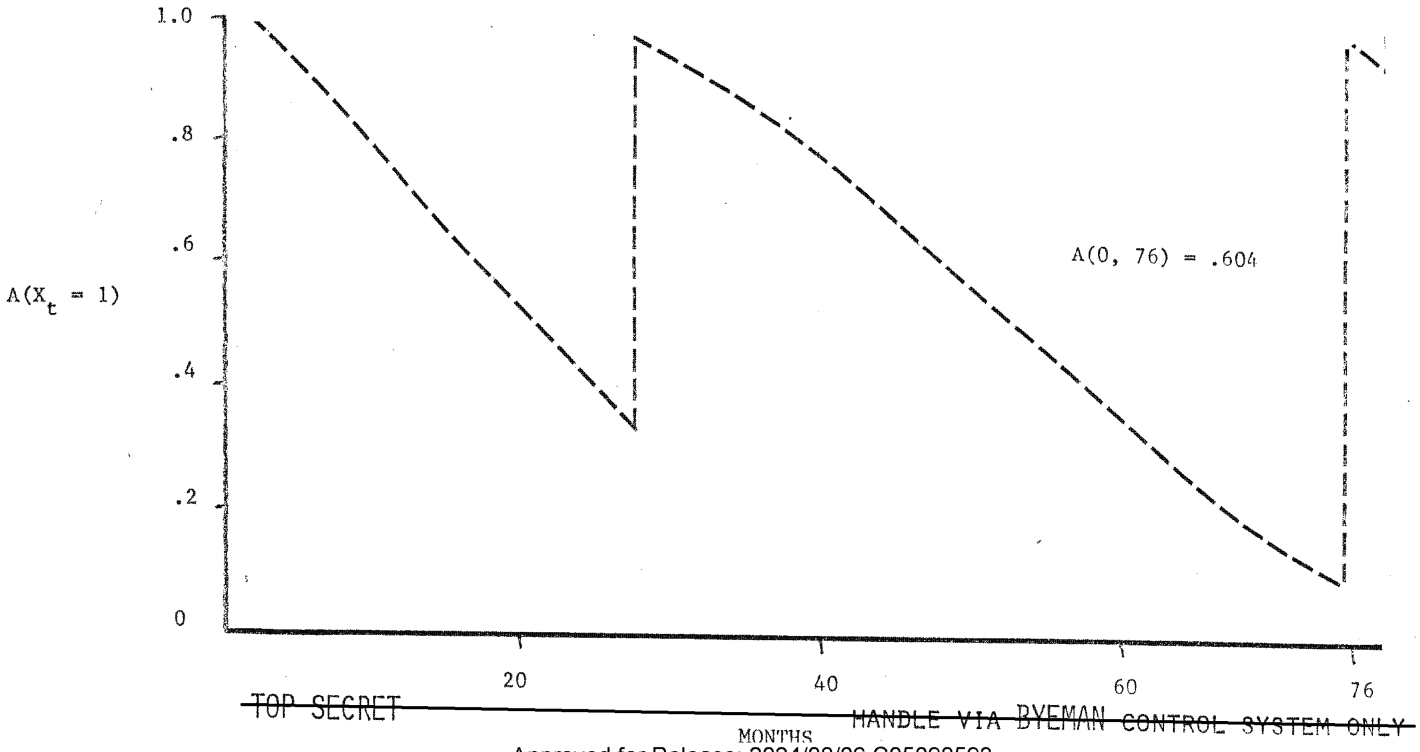
2. LAUNCH AVAILABILITY AND MILESTONES

ALTERNATIVE II (URSALA)



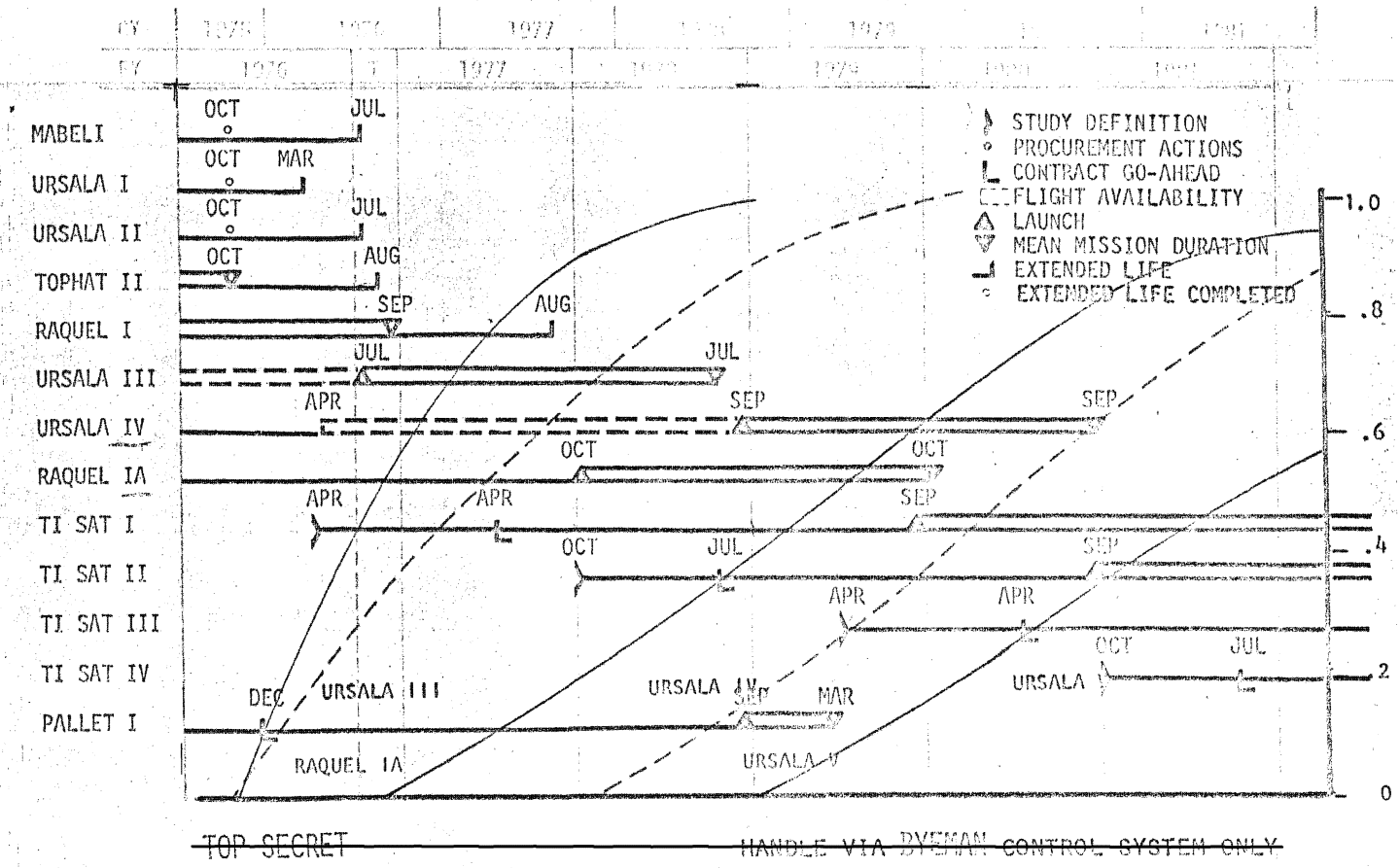
2. LAUNCH AVAILABILITY AND MILESTONES

POINT AVAILABILITY FUNCTION - ALTERNATIVE II (12-18 GHz)



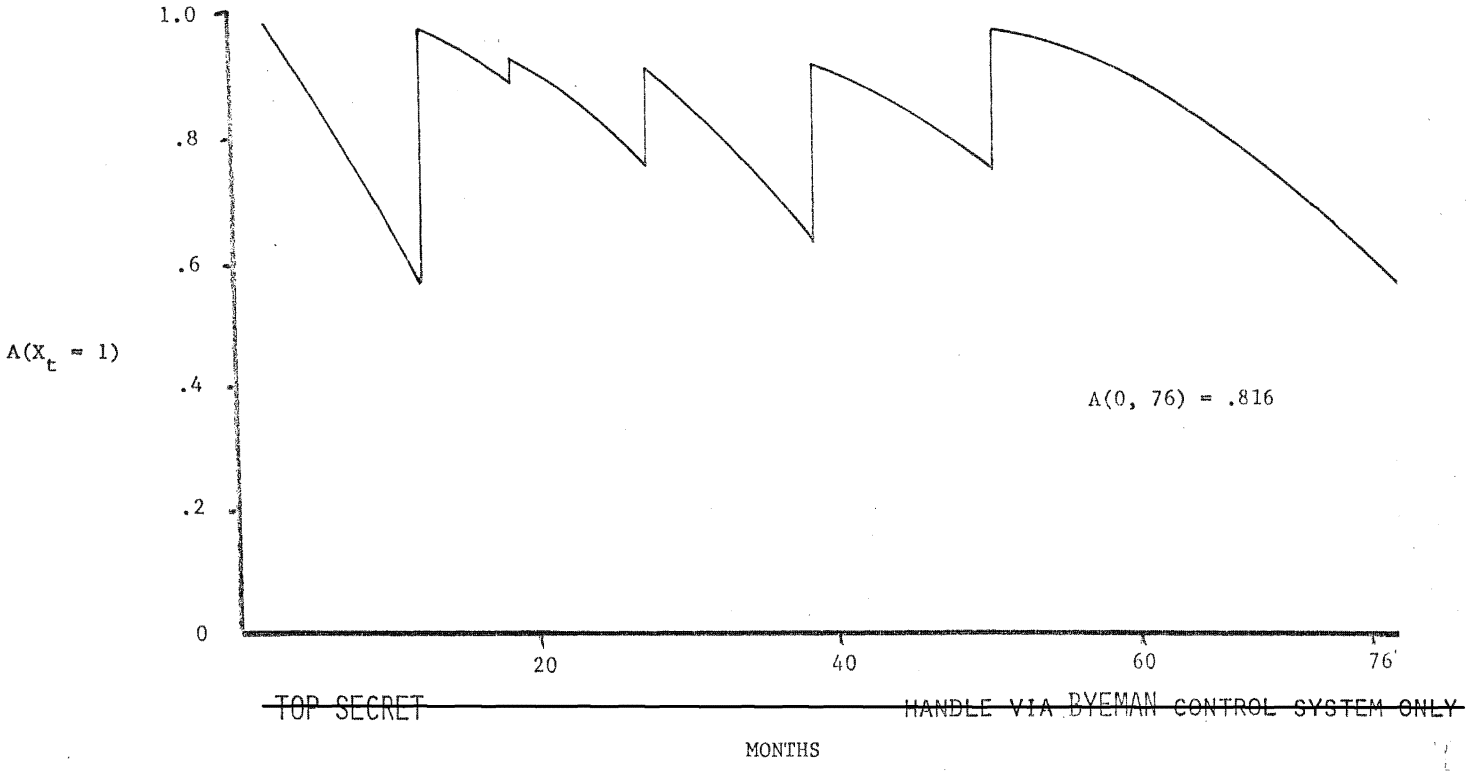
2. LAUNCH AVAILABILITY AND MILESTONES P-989

ALTERNATIVE III



2. LAUNCH AVAILABILITY AND MILESTONES

ALTERNATIVE III (URSALA)



2. LAUNCH AVAILABILITY AND MILESTONES

POINT AVAILABILITY FUNCTION - ALTERNATIVE III (12-18 GHz)