NAS Advanced Systems

MANAGEMENT SUMMARY

The Advanced Systems computers were introduced in 1976 by Itel Corporation. In October 1979, the product line was transferred to National Advanced Systems Corporation (NAS), a wholly owned subsidiary of National Semiconductor Corporation.

The initial Itel systems were direct replacements for IBM's 370/148, 370/158-1, and 370/158-3 systems, as well as effective replacements for the older System 360 models. Itel's marketing strategy was based on delivering the same performance levels as the comparable IBM systems at substantially lower costs.

NAS has completely revamped the Advanced Systems product line by introducing nine new models aimed primarily at the IBM 4341 and 303X Series markets. NAS's strategy is to offer performance levels equal to or better than the comparable IBM systems, usually at lower cost. However, some models that offer performance improvements carry higher price tags than their IBM counterparts.

The current Advanced Systems family consists of nine processor models: the AS/3000N, a successor to the Itel AS/3 and AS/4; the AS/3000, a redesign of the AS/5; the AS/5000N, AS/5000E, and AS/5000, which are based on the AS/7031; the AS/7000N, AS/7000, and AS/7000DPC, which are based on the AS/6; and the AS/9000, which is an entirely new design.

The AS/3000 is a replacement for the IBM 370/158-3 that offers equivalent performance at lower cost. The AS/3000N, AS/5000N, and AS/5000E are aimed at the ▷

> The NAS Advanced Systems family of computers consists of nine models that are compatible with IBM's System 370/158, 4341, or 303X Series processors. Of the nine models, three are equal in performance to their IBM counterparts, and six offer better performance than the comparable IBM systems. The NAS systems are functionally compatible with IBM's software, firmware enhancements, and peripheral equipment.

CHARACTERISTICS

SUPPLIER: National Advanced Systems (NAS), 800 East Middlefield Road, Mountain View, California 94043. Telephone (415) 962-6000.

MANUFACTURER: National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, California 95051. Telephone (408) 737-5000. Also Hitachi of Japan.
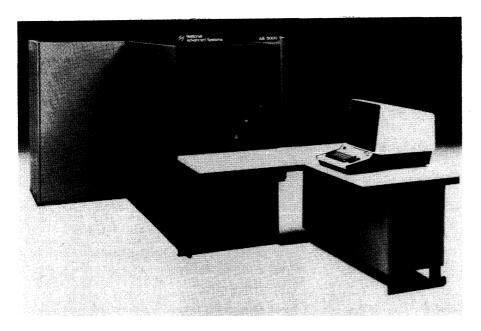
MODELS: AS/3000N, AS/3000, AS/5000N, AS/5000E, AS/5000, AS/7000N, AS/7000, AS/7000DPC, and AS/9000.

DATA FORMATS

All data formats, instruction formats, and other architectural features completely follow the IBM System/370 architecture.

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two consecutive bytes form a "halfword" of 16 bits, while 4 consecutive bytes form a 32-bit "word."

FIXED POINT OPERANDS: Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode; 1 halfword (16 bits) or 1 word (32 bits) in binary mode. ▶

The AS/5000 is a medium-scale system that is compatible with IBM's 3031 processor. The AS/5000 is considerably smaller than the IBM system and requires about 50 percent less power. A basic AS/5000 system consists of a processing unit with two megabytes of main memory, 32K bytes of buffer storage, six I/O channels, and a service processor console with keyboard/display unit and light pen.

NAS Advanced Systems

CHARACTERISTICS OF THE ADVANCED SYSTEMS PROCESSOR MODELS

	Model AS/3000N	Model AS/3000	Model AS/5000N	Model AS/5000E	Model AS/5000
SYSTEM CHARACTERISTICS					
Date of introduction	Jan. 1980	Jan. 1980	Sept. 1980	Sept. 1980	Jan. 1980
Virtual storage capability	Yes	Yes	Yes	Yes	Yes
Number of central processors	1	1	1	1	1
Principal operating systems	DOS/VS, DOS/VSE (370 mode), VM/370, OS/VS1, SVS	DOS/VS, DOS/VSE, (370 mode), VM/370, OS/VS1, SVS, MVS	DOS/VSE, VM/370, OS/VS1, MVS	DOS/VSE, VM/370, OS/VS1	DOS/VS, DOS/VSE, VM/370, OS/VS1, SVS, MVS
MAIN STORAGE					
Storage type	NMOS	NMOS	NMOS	NMOS	NMOS
Read cycle time, nanoseconds	920	920	460	460	460
Write cycle time, nanoseconds	690	690	460	460	460
Bytes fetched per cycle	8	8	8	8	8
Minimum capacity, bytes per system	2M	2M	2M	2M	2M
Maximum capacity, bytes per system	4M	8M	8M	8M	8M
Increment size, bytes	1M	1M	1M	1M	1M
Interleaving	No	No	No	No	No
BUFFER STORAGE					
Access time, nanoseconds	230	230	184	184	184
Bytes fetched per cycle	8	8	8	8	8
Minimum capacity, bytes	8K	16K	8K	32K	32K
Maximum capacity, bytes	8K	16K	8K	32K	32K
PROCESSING UNIT					
Machine cycle time, nanoseconds	115	115	92	92	92
Processing unit features:					
Clock Comparator & CPU Timer	Standard	Standard	Standard	Standard	Standard
Direct Control	Optional	Optional	Standard	Standard	Standard
Dynamic Address Translation	Standard	Standard	Standard	Standard	Standard
Floating Point	Standard	Standard	Standard	Standard	Standard
Extended Precision Floating Point	Standard	Standard	Standard	Standard	Standard
High-Speed Arithmetic	No	No	No	No	No
Firmware features:					
Reloadable Control Storage	8K (72-bit) words	8K (72-bit) words	16K (72-bit) words	16K (72-bit) words	16K (72-bit) words
Assist features	VS1: ECPS, VMA	VS1: ECPS, VMA	VS1: ECPS, VMA, VM: ECPS, 370 EF	VS1: ECPS, VMA, VM: ECPS, 370 EF	VS1: ECPS, VMA, VM: ECPS, 370 EF
Compatibility features:					
IBM 1401/1440/1460 compatibility	Standard	Standard	Standard	Standard	Standard
IBM 1410/7010 compatibility	Standard	Standard	Standard	Standard	Standard
IBM 7070/70704 compatibility	Standard	Standard	Standard	Standard	Standard
OS/DOS compatibility	Standard	Standard	Standard	Standard	Standard
CHANNELS					
No. of Selector Channels per system	None	None	None	None	None
No. of Block Multiplexer Channels	4	4	5 or 4	5 or 4	5 or 4
No. of Byte Multiplexer Channels	1	1	1 or 2	1 or 2	1 or 2

▷ IBM 4341 market, although the AS/5000E is not directly comparable to the 4341 because it offers significantly greater performance. According to NAS, the AS/3000N is equal in performance to the 4341, the AS/5000N offers 20 percent better performance than the IBM model, and the AS/5000E offers up to 60 percent improvement over the 4341. The AS/3000N is equal in price to the 4341 for equivalent configurations, while the AS/5000N and AS/5000E are priced higher than the 4341 but offer a 303X upgrade capability as well as better performance. The AS/5000 and AS/7000N are IBM 3031 and 3031AP replacements. The AS/5000 provides up to a 15 percent improvement over the performance of the 3031, while the ▷

▶ FLOATING-POINT OPERANDS: 1 word, consisting of 24-bit fraction and 7-bit hexadecimal exponent, in "short" format; 2 words, consisting of 56-bit fraction and 7-bit hexadecimal exponent, in "long" format; or 4 words in "extended precision" format.

INSTRUCTIONS: 2, 4, or 6 bytes in length, which usually specify 0, 1, or 2 memory addresses, respectively.

INTERNAL CODE: EBCDIC (Extended Binary-Coded Decimal Interchange Code).

MAIN STORAGE

STORAGE TYPE: 16K-bit negative metal oxide semiconductor (NMOS). ▶

NAS Advanced Systems

CHARACTERISTICS OF THE ADVANCED SYSTEMS PROCESSOR MODELS (Continued)

	Model AS/7000N	Model AS/7000	Model AS/7000 DPC	Model AS/9000
SYSTEM CHARACTERISTICS				
Date of introduction	Jan. 1980	Jan. 1980	Jan. 1980	Sept. 1980
Virtual storage capability	Yes	Yes	Yes	Yes
Number of central processors	1	1	2	1
Principal operating systems	DOS/VS, VM/370, OS/VS1, MVS, SVS	DOS/VS, VM/370, OS/VS1, MVS, SVS	VM/370, MVS	VM/370, OS/VS1, MVS
MAIN STORAGE				
Storage type	NMOS	NMOS	NMOS	NMOS
Read cycle time, nanoseconds	360	360	360	320
Write cycle time, nanoseconds	360	360	360	320
Bytes fetched per cycle	8	8	8	32
Minimum capacity, bytes per system	2M	4M	4M	8M
Maximum capacity, bytes per system	8M	16M	16M	16M
Increment size, bytes	2M	2M	2M	2M
Interleaving	4-way	4-way	4-way	8-way
BUFFER STORAGE				
Access time, nanoseconds	144	144	144	40
Bytes fetched per cycle	8	8	8	8
Minimum capacity, bytes	16K	64K	64K/CPU	64K
Maximum capacity, bytes	16K	64K	64K/CPU	64K
PROCESSING UNIT				
Machine cycle time, nanoseconds	72	72	72	40
Processing unit features:				
Clock Comparator & CPU Timer	Standard	Standard	Standard	Standard
Direct Control	Standard	Standard	Standard	Optional
Dynamic Address Translation	Standard	Standard	Standard	Standard
Floating Point	Standard	Standard	Standard	Standard
Extended Precision Floating Point	Standard	Standard	Standard	Standard
High-Speed Arithmetic	No	Standard	Standard	Standard
Firmware features:				
Reloadable Control Storage	6K (99-bit) words	6K (99-bit) words	6K (99-bit) words	16K (160-bit) words
Assist features	VMA, 370 EF	VMA, 370 EF	VMA, 370 EF	VMA, 370 EF
Compatibility features:				
IBM 1401/1440/1460 compatibility	No	No	No	No
IBM 1410/7010 compatibility	No	No	No	No
IBM 7070/70704 compatibility	No	No	No	No
OS/DOS compatibility	No	No	No	No
CHANNELS				
No. of Selector Channels per system	None	None	None	None
No. of Block Multiplexer Channels	5 or 6	6 to 12	10 to 12	8 to 15
No. of Byte Multiplexer Channels	1 or 2	2 to 4	2 to 4	1 to 5

▷ AS/7000N has 1.8 to 2.2 times the performance capability of the 3031. The IBM 3031 costs considerably more than the AS/5000, but less than the AS/7000N. The AS/7000 is aimed at the IBM 3032 market and offers up to 1.2 times the performance capability of the IBM model at lower cost. The AS/7000DPC is a dual-processor system that is equivalent in performance to IBM's 3033 processor, and is comparable in price to a 3033N. The target for the AS/9000 is the IBM 3033AP and 3033MP. The AS/9000 offers 1.8 to 2.2 times the performance of the 3033 uniprocessor model and costs less than either the 3033AP or 3033MP models.

The AS/3000N and AS/3000 have a processor cycle time of 115 nanoseconds, five I/O channels, and a minimum of two megabytes of main memory. Main memory can be expanded in one-megabyte increments to a maximum of four megabytes in the AS/3000N and eight megabytes in ▷

▶ CAPACITY: From 2 to 16 million bytes, in 1- or 2-million-byte increments, housed in 1 or 2 cabinets. (See the tables for capacities of the individual models.)

CYCLE TIME: See table.

CHECKING: Error checking and correction (ECC) circuitry in main memory performs automatic correction of all single-bit errors and detection of all double-bit and most other multiple-bit memory errors.

A reconfiguration capability is standard with all AS models. In the event of an unrecoverable error, or any other problem with a memory module, the operator can "dial out" the problem module (one-half million or one million bytes) and reconfigure the remaining memory for continuous operation.

STORAGE PROTECTION: The Store and Fetch Protection features, which guard against inadvertent overwriting and/or unauthorized reading of data in specified 2048-byte blocks of storage, are standard in all models. ▶

▷ the AS/3000. The AS/3000N has 8K bytes of bipolar buffer memory, while the AS/3000 has 16K bytes of buffer storage. Both models include a system console with a keyboard/display unit. The AS/3000N can be upgraded to an AS/3000.

The AS/5000N, AS/5000E, and AS/5000 have a machine cycle time of 92 nanoseconds, six I/O channels, and two to eight megabytes of main memory. The AS/5000N has 8K bytes of buffer storage, while the AS/5000E and AS/5000 have 32K bytes. Memory expansion is in one-megabyte increments. All AS/5000 Series systems include a system console with CRT, keyboard, and light pen. A console printer is standard on the AS/5000 only. The AS/5000N can be field upgraded to an AS/5000E or AS/5000, and the AS/5000E can be field upgraded to an AS/5000.

The AS/7000N, AS/7000, and AS/7000DPC feature a processor cycle time of 72 nanoseconds. The main memory capacity is from 2 to 8 megabytes on the AS/7000N and from 4 to 16 megabytes on the AS/7000 and AS/7000DPC. Main memory can be expanded in increments of two megabytes. Buffer storage capacity is 16K bytes on the AS/7000N, 64K bytes on the AS/7000, and 64K bytes per CPU on the dual-processor AS/7000DPC. The AS/7000 Series computers have a service processor console with CRT, keyboard, and light pen. A console printer is standard on all three models. The AS/7000N can be upgraded to an AS/7000, which in turn can be upgraded to an AS/7000DPC.

The AS/9000 has a processor cycle time of 40 nanoseconds, up to 16 I/O channels, 64K bytes of buffer memory, and a standard main memory capacity of eight megabytes, expandable to 16 megabytes in two-megabyte increments. The microprogram-driven service processor console for the AS/9000 includes two 4-color keyboard/display units, two independent processors, and two floppy disk drives. Up to two printers are available as options.

The Advanced Systems processors are compatible with IBM's System/360, System/370, 4300, and 303X Series software. Operating systems supported by the AS systems vary according to the model, but the principle operating systems for the AS processors include IBM's DOS/VS, DOS/VSE, VM/370, OS/VS1, SVS, and MVS. The AS processors also include firmware enhancements comparable to IBM's. The firmware enhancements implement several frequently used operating system functions in microcode for increased operational efficiency. Firmware assist features supported by the AS processors include System/370 Extended Facility, Virtual Machine Assist, VM Extended Control Program Support, and OS/VS1 Extended Control Program Support. The AS/5000 Series processors also support VSE Extended Control Program support. The System/370 Extended Facility enables NAS users to execute the MVS/SE or MVS/SP enhancement program product that permits the MVS operating system to utilize the firmware enhancements. ▷

▶ **CENTRAL PROCESSOR**

INDEX REGISTERS: Sixteen 32-bit general registers, used for indexing, base addressing, and as accumulators, plus four 64-bit floating-point registers per processor.

INSTRUCTION REPERTOIRE: The AS instruction set consists of the complete System/370 Universal Instruction Set, including the five S/370 instructions for Dynamic Address Translation. The AS/5000 Series processors have also implemented the 13 additional instructions in the 4300 instruction set.

INSTRUCTION TIMES: NAS states that individual instruction times are not currently available, but that average execution times for the AS systems will equal or exceed the performance of the comparable IBM processors (see Management Summary).

OPERATIONAL MODES: Like the System/370, the NAS AS computers can operate in either the Basic Control (BC) mode or Extended Control (EC) mode. The BC mode maintains general upward compatibility with the System/360 architecture and programming. In the EC mode, the Program Status Word (PSW) and the layout of the permanently assigned lower main storage area are altered to support Dynamic Address Translation and other system control functions; therefore, the virtual-storage-oriented operating systems must be used.

PROCESSOR FEATURES: The timing features of the System/370 architecture are included in the AS central processors. These include a CPU timer and a Clock Comparator; the latter provides a means for causing an interrupt when the standard Time-of-Day Clock reaches a program-specified value. Additional instructions are provided to set and store the Time-of-Day Clock, Clock Comparator, and CPU Timer.

The Direct Control feature provides six external interrupt lines which operate independently of the normal data channels, plus the Read Direct and Write Direct Instructions which provide for single-byte data transfers between an external device and main storage. Direct Control is standard on the AS/5000 Series and the AS/7000 Series, and optional on the AS/3000 Series and the AS/9000.

The Floating-Point Arithmetic feature provides instructions to perform floating-point arithmetic operations on both short (1-word) and long (2-word) operands.

The Extended Precision Floating-Point feature provides seven instructions for performing floating-point arithmetic on 4-word (16-byte) operands that provide a precision of up to 28 hexadecimal or 34 decimal digits.

A High-Speed Arithmetic capability is standard on the AS/7000, AS/7000DPC, and AS/9000. This feature reduces the time required to process fixed- and floating-point multiply and floating-point divide instructions.

The Channel-to-Channel Adapter permits direct communication between an AS processor and a System/370 via a standard I/O channel. It can be attached to either a selector channel or a block multiplexer channel and uses one control unit position on either channel. Either system can be equipped with the Channel-to-Channel Adapter, and it is required on only one of the interconnected channels. The Channel-to-Channel Adapter is standard on the AS/5000, AS/7000N, AS/7000, AS/7000DPC, and AS/9000; it is optional on the AS/5000N and AS/5000E.

The Two-Byte Interface option, available on the AS/7000 Series and the AS/9000, doubles the bandwidth of the data path between the I/O channel and the control units that support this feature. ▶

NAS Advanced Systems

▷ The Advanced Systems processors have fewer components than their IBM counterparts, thus reducing power consumption, heat dissipation, and floor space requirements. All Advanced Systems computers are air-cooled.

NAS states that it has installed more than 500 computers worldwide. All Advanced Systems processors are currently available, except the AS/5000N, AS/5000E, and AS/9000, which will all be available in the fourth quarter of 1980.

COMPETITIVE POSITION

Aside from the declared IBM system targets, the NAS Advanced Systems' chief competition comes from the M80 systems introduced by Magnuson Computer Systems and the Omega/480 systems from Control Data Corporation. The M80 processors are direct replacements for IBM's 370/138, 370/148, 4331, and 4341 systems. The Omega/480 processors are comparable to the IBM 370/138, 370/148, and 370/158 systems. The earlier Advanced Systems models were not in competition with Amdahl's plug-compatible mainframes, because Amdahl produced more powerful systems aimed at the IBM 370/168 replacement market. Now, however, both Amdahl and NAS have 303X-compatible processors, and NAS's top-of-the-line AS/9000 should compete successfully with Amdahl's 470V/8 system.

USER REACTION

NAS had just introduced the first of its new Advanced Systems models at the time that Datapro's 1980 survey of computer users was conducted. However, 37 users reported on their experiences with the older AS models. Since the earlier models are the forerunners of most of the current product line, we felt that the experience of these users would have some relevance in the evaluation of the new models.

The 37 survey respondents had a total of 51 systems installed: 9 AS/3 and AS/3-5 systems, 29 AS/5 and AS/5-3 systems, 4 AS/7031 systems, and 9 AS/6 systems. The majority of these systems were being used for business applications. COBOL was the primary programming language in nearly all of the installations.

The Weighted Averages earned by the various AS models are listed in the table below.

	AS/3, AS/3-5 WA*	AS/5, AS/5-3 WA*	AS/7031 WA*	AS/6 WA*
Ease of operation	3.8	3.6	3.5	3.3
Reliability of mainframe	3.3	2.9	3.3	3.8
Reliability of peripherals	3.1	2.8	2.3	2.6
Maintenance service:				
Responsiveness	3.4	3.1	3.3	3.2
Effectiveness	3.3	2.8	3.3	2.9
Technical support:				
Trouble-shooting	3.1	2.6	3.3	2.7
Education	2.8	2.6	3.0	2.5
Documentation	2.9	2.9	2.8	2.4 ▷

▶ The AS/7000 Series and AS/9000 processors feature a pipeline technique that provides overlapped instruction decoding and execution. The AS/7000 Series has a 256-entry Translation Lookaside Buffer (TLB), used to store the most recently referenced addresses, and a 5-entry Segment Table Origin (STO) stack that stores information on the size and main memory location of the segment table associated with TLB entries. The AS/9000 has a 512-entry TLB and a 512-entry STO.

Channel retry, instruction retry, I/O operation retry, enhanced I/O logout, and a stage tracer for fault logging are standard on the AS/7000 Series. The AS/9000 features a Log-Out Analyzer that speeds fault diagnosis and verification. In addition to the error-logging facility supported by the operating system, up to 9K bytes of status information is logged to the console diskette whenever there is a CPU or channel malfunction. The status information can be recalled and analyzed by a Field Engineer without affecting normal system operation. The AS/9000 also has a remote support capability that allows information from a failing CPU to be accessed by a remote support site through a telecommunications link. This capability enables the remote support site to receive logout information from, and assume control of, the service processor of the failing CPU. The remote facility can then process the information to diagnose the problem.

SYSTEM CONSOLES: The operator communicates with an AS system via the system console, which also serves as a diagnostic console for maintenance purposes. The AS/3000 Series includes a compact, desk-type console with built-in keyboard/display unit. The AS/5000 Series and AS/7000 Series feature service processor consoles with keyboard/display unit and light pen. The AS/7000 Series console also has an integral maintenance panel.

Each service processor has its own Reloadable Control Storage (RCS). A remote console is available as an option. The AS/9000's service processor console includes two 20-inch four-color display units, two independent processors, and two flexible disk drives. A remote diagnostic capability is provided.

MULTIPROCESSING CONFIGURATION: The AS/7000DPC (Dual Processor Complex) consists of two independent processors that share a common main memory with a capacity of 4 to 16 million bytes. Buffer storage capacity is 64K bytes per processor. If one AS/7000DPC processor fails, the system can be reconfigured to a uniprocessor system through the operator console or the operating system. A Channel Cross-Call feature allows control of input/output operations to be switched to the available processor.

INPUT/OUTPUT CONTROL

The AS/3000 Series and AS/5000 Series processors include five and six integrated I/O channels, respectively. The six I/O channels on the AS/5000 Series can be configured as one or two byte multiplexer channels and four or five block multiplexer channels. The AS/7000N and AS/7000 processors include one microprogram-controlled I/O Processor as standard, while the AS/7000DPC and AS/9000 include two I/O Processors. The I/O Processors support from 6 to 16 channels. (See the tables for the exact number of channels available for each processor model.) An additional I/O Processor must be added to the AS/7000 and AS/9000 to support the maximum number of channels. Although the standard configuration on the AS/9000 is 2 byte multiplexer channels and 10 or 14 block multiplexer channels, the system can optionally be configured with a combination of 1 to 5 byte multiplexer channels and 8 to 15 block multiplexer channels, to a maximum of 16 channels. ▶

NAS Advanced Systems

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	AS/3, AS/3-5 WA*	AS/5, AS/5-3 WA*	AS/7031 WA*	AS/6 WA*
Manufacturer's software:				
Operating system	3.3	3.0	3.7	3.0
Compilers & assemblers	3.4	3.2	3.7	2.9
Applications programs	3.5	3.1	3.5	2.9
Ease of programming	3.0	3.2	3.7	3.0
Ease of conversion	3.6	3.3	3.5	3.2
Overall satisfaction	3.3	2.9	3.5	3.0

*Weighted Average on a scale of 4.0 for Excellent.

The users' ratings indicate that they were generally satisfied with the Advanced Systems processors, but saw a need for improvement in the area of vendor technical support.

In August 1980, we interviewed five of the survey respondents to gain further insight into their experiences with the AS systems. The users interviewed included two service bureaus, a bank, a utility company, and a manufacturer. Two had AS/5-3 processors, one had an AS/7031 processor, and two had AS/6 systems.

One AS/5-3 user stated that the vendor did not provide all the promised support and that the machine downtime was excessive. He commented, "It's a good machine when it works, but it's down at least once a month." The other AS/5-3 user expressed dissatisfaction with NAS's software support, although he said that the service personnel have shown "an increased desire to make things work" since NAS took over. Conversely, a user who has had an AS/5-3 installed since February 1979 wrote the following comment on the survey form: "Our present system, the Itel, has not once gone down since it was first installed. It is really the most reliable piece of equipment I've worked on over the past 13 years."

The AS/7031 user we interviewed also expressed dissatisfaction with the vendor's support and said that downtime was excessive.

The two AS/6 users we talked to were very well satisfied with their systems. One, who rated all categories in our survey as "Excellent", said he had experienced no problems with the AS/6. He said the CPU has been down only once in two years, and then for only 45 minutes. He also stated that he was planning to upgrade to an AS/7000 DPC. The other AS/6 user stated that the AS/6 is the "most reliable system" he has worked on and that there have been no major problems.

It is not unusual for users of computer equipment to express such widely differing opinions. The comments above apply only to the older AS systems. It remains to be seen how the new AS models will fare.□

▶ Each I/O channel implements the standard IBM interface and is provided with 256 Unit Control Words. Block multiplexer channels have a data transfer rate of 1.5 megabytes per second on the AS/3000 Series, 1.86 megabytes per second on the AS/5000 Series and AS/7000 Series, and 1.9

megabytes per second on the AS/9000. The data transfer rate for byte multiplexer channels is 100K bytes for all processor models.

PERIPHERAL EQUIPMENT

The NAS systems can utilize all IBM System/360, System/370 input/output and mass storage devices, as well as their plug-compatible counterparts from independent vendors.

NAS currently markets the 7830/7330 and 7350 Disk Storage Subsystems, which are plug-compatible replacements for the IBM 3330 Disk Storage Facility and the IBM 3350 Direct Access Facility, respectively. The NAS 7803/7420 Magnetic Tape Subsystem is plug-compatible with IBM's 3803/3420 Magnetic Tape Subsystem. (See reports 70D6-655-01, 70D6-655-02, and 70D6-655-05 in Volume 2 for detailed descriptions of these systems.)

In addition, NAS plans to support IBM's recently announced 3880/3375 and 3880/3380 disk subsystems on the AS/5000 Series, AS/7000 Series, and AS/9000. The AS/5000 Series also supports IBM's new 3370 disk drive. Compatibility with IBM's Data Streaming feature, which allows data transfer at three megabytes per second, will be provided for the 3380 disk drive in the third quarter of 1981 and for the 3375 disk drive in the first quarter of 1982. NAS will provide support for IBM's Speed Matching Buffer option, which allows the attachment of the 3880 control unit to channels with data rates lower than three megabytes, in the second quarter of 1982.

SOFTWARE

The Advanced Systems offer complete functional compatibility with IBM System/360, System/370, 4300, and 303X Series software. NAS supports users of current IBM system software by providing new releases of the software and supplying software support services for its customers.

The AS systems include firmware that supports the following IBM operating system enhancements: System/370 Extended Facility (370 EF), which allows the use of the MVS/System Extensions (MVS/SE) and MVS/System Product (MVS/SP); OS/VS1 Extended Control Program Support (VS1: ECPS); Virtual Machine Assist (VMA); and Virtual Machine Extended Control Program Support VM: ECPS. In addition, the AS/5000 Series provides Virtual Storage Extended, Extended Control Program Support (VSE: ECPS) capabilities. All of these enhancements improve system throughput by implementing a number of frequently used system routines in microcode. (See the tables for the microcode assist features available on the individual AS processors.) For the AS/3000 and AS/3000N, NAS provides Extend, a proprietary software product that simulates 370 EF to enable the AS/3000 Series processors to support MVS/SE.

PRICING

Purchase prices for the NAS Advanced Systems are listed below. NAS did not provide lease prices, but stated that operating and full-payment leases of variable lengths are available from local NAS sales offices.

NAS offers two levels of software support. The Central Program Support Center function in Mountain View and San Diego, California, provides a Central Program Support Service, which includes telephone assistance 24 hours a day, 7 days a week, customer guidance in IPAR (Incident Program Analysis Report) preparation, problem diagnosis advice, temporary fix or bypass service, and PTF selection and application assistance. The Local Program Support Service at the customer site includes problem diagnosis, ▶

OCTOBER 1980

NAS Advanced Systems

➤ IPAR preparation and submission assistance, local fix or bypass development and assistance, and PTF/PUT application problem assistance. The Local Program Support Service is available as an option on the AS/3000 Series and AS/5000 Series systems. Customers can elect to pay a monthly program support charge or to pay hourly rates. The Local Program Support Service is included in the maintenance fees for the AS/7000 Series and the AS/9000.■

		Purchase	Monthly Maint.*
PROCESSOR COMPLEXES			
AS/3000N	Processor with 2 megabytes of main memory, 8K bytes of cache memory, 5 I/O channels, and system console with CRT and keyboard	$275,000	$2,280
AS/3000	Processor with 2 megbytes of main memory, 16K bytes of cache memory, 5 I/O channels, and system console with CRT and keyboard	310,000	2,425
AS/5000N	Processor with 2 megabytes (Model N2) or 4 megabytes (Model N4) of main memory, 8K bytes of cache memory, 6 I/O channels, and system console with CRT, light pen, and keyboard	335,000 (Model N2); 385,000 (Model N4)	2,646 2,926
AS/5000E	Processor with 2 megabytes of main memory, 32K bytes of cache memory, 6 I/O channels, and system console with CRT, light pen, and keyboard	500,000	2,793
AS/5000	Processor with 2 megabytes of main memory, 32K bytes of cache memory, 6 I/O channels, system console with CRT, light pen, and keyboard, and 120-cps console printer	600,000	3,200
AS/7000N	Processor with 2 megabytes of main memory; 16K bytes of cache memory; I/O processor; 6 I/O channels; power distribution unit**; system console with CRT, keyboard, and light pen; and console printer	1,100,000	8,000
AS/7000	Processor with 4 megabytes of main memory; 64K bytes of cache memory; I/O processor; 8 I/O channels; 2 power distribution units;** system console with CRT, keyboard, and light pen; and console printer	1,525,000	9,340
AS/7000DPC	Dual processors with 4 megabytes of main memory; 64K bytes of cache memory per processor; 1 I/O processor; 8 I/O channels; 3 power distribution units**; system console with CRT, keyboard, and light pen; and console printer	2,175,000	11,708
AS/9000	Processor with 8 megabytes of main memory, 64K bytes of cache memory, 2 I/O processors, 12 I/O channels, 2 power distribution units**, and system console with 2 service processors, dual 4-color CRT's with keyboards, and 2 floppy disk drives	3,950,000	17,000
PROCESSOR OPTIONS			
AS/3000 Series	Additional main memory, each megabyte	50,000	175
	Console printer	7,000	147
	Direct Control feature	3,500	22
	Local Program Support	—	600
	AS/3000N to AS/3000 upgrade	40,000	—
AS/5000 Series	Additional main memory, each megabyte	50,000	280
	Remote console	25,000	30
	Console printer for AS/5000N and AS/5000E	7,000	147
	Channel-to-Channel Adapter for AS/5000N and AS/5000E	25,000	132
	Local Program Support for AS/5000N and AS/5000E	—	600
	Local Program Support for AS/5000	—	700
	AS/5000N to AS/5000E upgrade	165,000	—
	AS/5000N to AS/5000 upgrade	265,000	—
	AS/5000E to AS/5000 upgrade	100,000	—
AS/7000 Series	Additional main memory, each 2-megabyte increment	100,000	400
	Each additional I/O channel	25,000	30
	Second I/O processor for AS/7000	75,000	500
	Second system console	40,000	294
	Two-byte interface for I/O processor	6,000	2
	Multi-EPO switch	10,000	3
	Power control interface	10,000	3
	AS/7000N to AS/7000 upgrade	350,000	—
	AS/7000 to AS/7000DPC upgrade	900,000	—
AS/9000 Series	Additional main memory, each 2-megabyte increment	80,000	400
	Additional I/O processor with 4 channels	250,000	620
	Additional system console	140,000	442
	Two-byte interface for I/O processor	5,000	—
	Channel-to-Channel Adapter (maximum of 3)	14,000	15
	Printer (maximum of 2)	6,000	147
	Direct Control feature	1,500	22

* Complete maintenance service for 24 hours/day, 7 days/week.
**Includes motor generator sets.