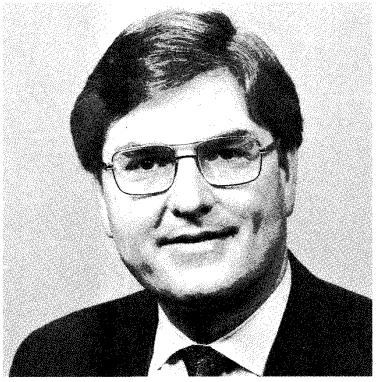
the Center



Robert F. Buffum
Technical Director

I thank all of you for your support during the past year. It seems each year has its own peculiar problems to overcome and our working together is the only way to stay on top of a rapidly changing environment.

The Center is as strong technically as it has ever been and availability of funds is not a problem. In fact, we must be cautious in our acceptance of new work to ensure a correct match with our long term goals.

For the sake of brevity, I am listing here a series of statements which summarize the State of the Center with regard to Technology and Systems.

With respect to our technology base, this fiscal year has seen major changes in the outside management of our programs. Most of the SYSCOMS technology base management role has been taken over directly by the Office of the Chief of Naval Research (OCNR). This has placed NADC into a more direct line of responsibility for the management of our technology efforts. The significance of this lies in our meeting that responsibility and being responsive to the requirements of the three segments of OCNR; namely, the Office of Naval Research (ONR), the Office of Naval Technology (ONT) and the Office of Naval Laboratories (ONL). This year of transition to a new management chain may be a difficult one, but one in which we have an opportunity to affect the future of the Center's technology base.

Another important change in the Center's management of our technology base is the formation of an Associate Technical Director for Technology, a position which is currently being scoped. This should greatly ease the technology interfaces between our new Warfare Area and Engineering and Technology Directorates. Also those outside the Center will have a focal point for all technology matters.

Block programming continues to be the heart of our technology base. With the restructuring of our command headquarters and the reshaping of some of the Blocks, this Center has been assigned responsibility for the following Block Programs: **Air ASW Surveillance, Navigation and Aircraft C^3, Aircraft Materials, Air Platforms and Systems,** and **Airborne Surveillance.**

Although reduced in number from nine to five, these programs will make up close to 75% of our exploratory development funds.

"This year of transition to a new management chain may be a difficult one, but one in which we have an opportunity to affect the future of the Center's technology base."

Using our FY-86 projections, the technology base will comprise almost 18% of the total Center funding. A good portion of these funds goes to other Navy Laboratories, Universities, and Industry. The portion of monies used off-station amounts to approximately 52%.

The IR/IED Program will continue to be driven to support technology shortfalls of the Center. Although slightly less than 5% of tech base funds are IR/IED monies, these projects continue their high visibility on the Center. The following is a list of some of the major IR/IED activities:

- **Advanced Magnetic Storage Technology**
- **Chemically Modified Surface for Corrosion Protection**
- **Hybrid Composite Structures**
- **Artificial Intelligence for Airborne Tactical Alerting**
- **Optical Fiber Antenna/ Receiver for LF Communications**
- **Repairability of Radar Absorbing Structures**
- **Non-Destructive Evaluation of Metal and Ceramic and Matrix Composites**
- **Optical Computing and Networking**
- **Braided Composite Structures**
- **High Altitude Loiter Aircraft Technology**

In our systems world, the Center is emphasizing certain warfare and mission base areas. Included are AAW, ASUW on ASW/TACAIR platforms, ASW, EW, ROTARY WING, TACTICAL C^3, and UVS (Unmanned Vehicle Systems). The technology base planning reflects support of these emphasis areas. Many new initiative areas are being pursued which will also support these emphasized mission areas. These include:

- **Application of Artificial Intelligence**
- **Advanced Tactical Aircraft**
- **Unmanned Air Vehicle Systems**
- **VHSIC Technology Transition Applications**
- **Mobile Tactical Surveillance Vehicle**
- **Optical Sonobuoy**
- **Fiber Optic Gyroscope**
- **Navigation Based Gridlock**
- **Non-Conventional Velocity Sensors**
- **Optical Recording**
- **Advanced Software Technology**
- **High Altitude — Long Endurance Remotely Piloted Vehicles**
- **Oblique Wing Research Aircraft**
- **Advanced Lighter Than Air Vehicles**

The following ten top system programs being supported by our technology are bringing in over $70M to the Center this year:

- **NAVSTAR Global Positioning System**
- **Target Systems Development**
- **P-3C Update IV**
- **Low Cost Sonobuoy System**
- **P-3C ASP and Acoustic Integration**
- **Aircraft Fuel Conservation RDT&E Program**
- **P-3C Modernization C-MOD**
- **Navy Aircrew Common Ejection Seat**
- **Enhanced Modular Signal Processor Development**
- **Airborne Common Acoustic Processing**

Here are some significant technology accomplishments over the past few years:

- First Production P-3C Update III developed by NADC delivered to the fleet with greatly enhanced acoustic ASW capability.
- All optical fiber, zero frequency magnetometer demonstrated for improved non-acoustic ASW capability.
- Chemical conversion coatings for aluminum have been developed which greatly enhance corrosion protection in the Naval environment.
- In-situ composite structures repair techniques developed for depot level application will significantly reduce costs.
- Light amplification by Xenon atoms in the presence of atmospheric gasses was discovered with a postulated far-reaching impact on Naval systems.
- Tactical Air Reconnaissance Pod (TARPS) designed, developed and produced by NADC is now the only organic photo reconnaissance capability in the fleet.
- Significant life cycle savings are projected following the design verification of an ejection seat for common application to Naval aircraft.
- AN/TAS-6 Infrared night vision sensor added to the H-2 and H-3 helicopters with the fleet in the East Mediterranean introducing a critically needed capability for tracking surface ship movements.

As mentioned by the Captain in his year end message, this year the Center will experience little or no personnel growth over FY-85 year end totals. This still leaves us with a projected S&E total of 1550 indicating that slightly more than 60% of the work force will be made up of Scientists and Engineers.

Again, your support over the past year is greatly appreciated. I know that I can count on that support continuing throughout this current year. My personal wish for each and every one of you is a happy, healthy and prosperous New Year.

"The ten top system programs being supported by our technology are bringing in over $70M to the Center this year."

Moser and Campana named Meritorious Civilians

Paul Moser,
Associate Director,
Sensors and Avionics
Technology Directorate

Paul Moser, a thirty-year veteran of NADC, is an internationally recognized expert in research and development of new sensors. Moser plays a major role in the technical work needed to support the development of sensors for anti-submarine warfare. His superiors have described him as a valuable asset possessing keen technical scrutiny.

Moser's Meritorious Civilian Service Award cited him for professional example and technical leadership instrumental in shaping a Navy center of excellence in research and development of airborne passive infrared imaging devices and other naval sensor schemes applied to submarine detection. (MAB)

Stephen Campana,
Head, Remote Sensing Branch,
Sensors and Avionics
Technology Directorate

Meritorious Civilian Service Award winner Stephen Campana administers a major share of the Navy research, exploratory and advanced development program in laser, sensor, and image and signal processing technology and systems.

For twenty years he has contributed to the development of naval airborne electro-optical and infrared reconnaissance and surveillance. Campana was recognized for consistent diligence and technical excellence resulting in a solid foundation for the next generation of airborne surveillance and reconnaissance equipment. (MAB)

Reenlistments

AD3 Norman G. Watson (seated) signs his reenlistment papers for six more years in the presence of CAPT Edward Sturm. Watson received orders to VP-8, NAS Brunswick, Maine.

AKC Alfredo Mabini reenlisted in the Supply Office on December 5th. CDR Milton Weaver (right), Supply Officer, was the reenlisting officer and Mabini's wife, Judy, and daughter, Sherry were at his side. Mabini received orders to Sigonella, Italy.

Chief Hospital Corpsman Leyland Donnan reenlisted for two more years. Donnan hasn't received new orders yet since he'll be at the Center for another year.

Senior Chief Aviation Anti-Submarine Operator Chris T. Kaiser (right) reenlisted December 23rd. Center Commander CAPT Edward Sturm swore Kaiser in for two more years.

Last VIP for 1985

RADM Ready visits on New Year's Eve

Rear Admiral John K. Ready, new Commander of the Naval Air Test Center (NATC) in Patuxent River, MD, visited the Center on December 31st. Presentations to the Admiral, including a Command Projects overview, tours of the S3 and P3 labs, and briefs on the F/A-18R, Hornet II, and the Naval Airship Program, stressed the interface between NADC and NATC on mutual programs.

RADM John K. Ready and Technical Director Robert Buffum entering the Center for the Admiral's briefing.

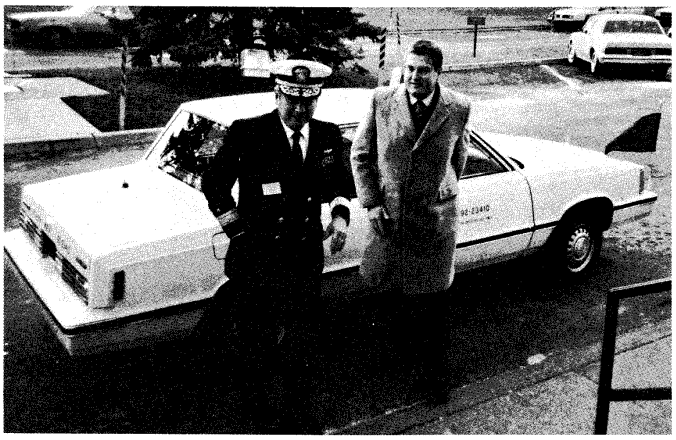


Photo by Jim Kingston

Commodore nevermore

A Commodore isn't a Commodore anymore! He is a Rear Admiral (Lower Half) according to the Secretary of the Navy. The FY-86 Defense Authorization Act has changed the title of the grade 0-7 from Commodore to Rear Admiral (Lower Half). It will still remain a one star rank. The Grade 0-8 will remain officially Rear Admiral. Both will use the title Rear Admiral in correspondence and the abbreviation RADM will be used for both grades. A reminder that when addressing all Flag Officers, the title "Admiral" is appropriate.

DNL receives Presidential Award

Gary W. Morton, Director of Navy Laboratories within the Office of the Chief of Naval Research, has been awarded the Meritorious Executive Presidential Rank Award for 1985. The award of $10,000 was accompanied by a certificate signed by President Ronald Reagan.

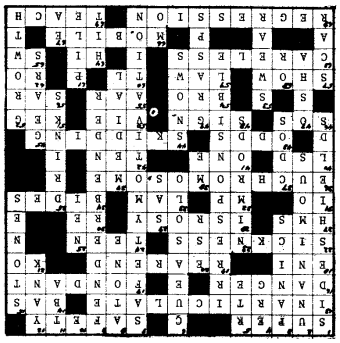
Morton was cited for his accomplishments in leadership and management, many of which have enhanced productivity, encouraged innovation, ensured maximum product effectiveness, and reduced costs.

Besides Morton, the Office of the Chief of Naval Research also produced four other award winners: Dr. Marvin Moss, Director of the Office of Naval Research; Dr. Philip Selwyn, Director of the Office of Naval Technology; Earle Messere, Technical Director at the Naval Underwater Systems Center in Newport, Rhode Island; and Guy Dilworth, Technical Director at the Naval Coastal Systems Center in Panama City, Florida.

As Director of Navy Laboratories, Morton advises the Navy on matters including policy, mission, facilities, manpower needs, administration, organization, and planning. In addition, Morton is responsible for directing and overseeing eight laboratories.

These laboratories conduct full-spectrum, weapons-related research — from initial concept through advanced engineering to actual integration in an operational Fleet setting. They administer a $3.4 billion budget and employ 24,000 civilian and 1,600 military personnel. The Navy relies on the laboratories to sustain the technological strength necessary to help safeguard national security.

Solution for *safety puzzle* located on page 12



State of the Center

Continued from page 6

actions, I have directed individual managers to strategically control factors such as performance rating rewards and training availability.

I am aware that there are still other areas that trouble many of you. Many of these are "facts of life" with which we have to deal. Issues such as limited overtime distribution, non-mission indirect workload and external travel regulations must be accepted as beyond our control. We must work within these constraints. Wherever possible, I have taken steps to assure that improvements are made in areas we can control. Improving our working environment and the overall quality of life at this Center is important and is receiving attention at the highest levels.

Central Computer System (CCS) and Office Automation Computer System

The CCS here is one of our primary assets and is unique in its capabilities. Like all other major Center assets, the CCS must be self-supporting. Numerous studies have shown that the CCS is an extremely cost-effective means of attaining computing time and power. The CCS is being updated to ensure that it stays current and with the state-of-the-art.

Individual projects/programs that require desk-top, mini or micro computing support are evaluated on a case-by-case basis by the ADP official. This will continue to be the way ADP support is handled at the Center.

Electronic Office Automation (OA) is moving ahead and more than 345 systems have been delivered and installed. Current indications are that all Directorate, Department, Division and Branch secretaries and clerks, as well as a good portion of our technical personnel should have systems installed by March 1986. The systems will continue to be installed at the rate of approximately 50 per month.

Financial

Early in FY-86, Code 02 will initiate a three-day training session for all directorates on the Center Information System (CIS) to make all managers aware of the reporting tools available to them. This training should help everyone by creating a better understanding of the financial tools currently available to help with your workload.

Business Planning Computer Data Base

There is a need for a central, standardized data base for Center planning. Currently, the Executive Reporting Module (ERM) is used to track and report on Directorate goals and objectives as well as provide summary screens on other top-level business indicators. The CIS users group has been offered the opportunity to input requirements for a subset level ERM to be used by the Directors. This group is currently working on the problem and has already defined a preliminary design specification. It will be their responsibility to address the Directorate concerns in both input and output formats.

The Future

What does 1986 hold for us? It is clear that we must finish our strategic planning effort and take clear aim at our goals. Every indication is that we will continue to experience growth in our workload despite our efforts to hold it to FY-85 levels. Unlike last year, there will be little or no personnel growth. Your Center leadership concluded, independent of outside pressures last summer, that it was not in the Center's best interest to take on additional new hires beyond attrition in FY-86, because we needed time to assimilate the 300-plus new FY-85 hires into our workforce, and we were running out of space. In November, the Secretary of the Navy added additional weight to this decision when he directed that the growth of the Navy R&D Centers be curtailed. We will be complying with this direction. In late Spring or early Summer, we will have a ground-breaking for our new TACAMO/GPS building as well as see some additional refurbished office space come into use. All in all, it should be a good year, I look forward to it as well you should.

Alcohol & drug abuse prevention

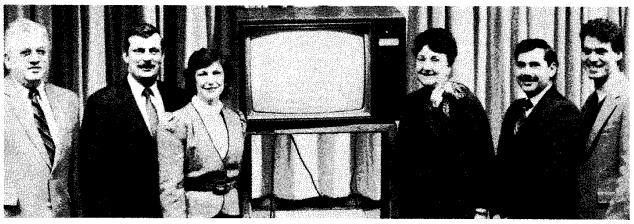


Photo by Regina Gasuk

L to r: Dino Mancinelli (Warminster Rotary), Bill Davis (Warminster Alcohol and Drug Abuse Council), Dr. Vail Garvin (Warminster General Hospital), Irene Vitale (Bell of Pennsylvania), George Gianios (President, Warminster Rotary) and Peter Wray (actor).

Warminster is serious about fighting alcohol and drug abuse. Bill Davis was the driving force behind a 25-minute video "We all know Joe", recently shown at the Center. The film, designed to inform and mobilize the community against alcohol and drug abuse, was created and financed in large part by Bell of PA, Warminster Rotary, and Warminster General Hospital. (MAB)

If the 'SOC' fits

by Robert Janes

Most employees are aware of the need to avoid any on-the-job involvement with companies in which they have stock or bonds. The Standards of Conduct (SOC) likewise require that employees avoid dealing with companies with whom they have made arrangements or are negotiating with for prospective employment. In fact, there is also a federal statute which prohibits this, and makes it a crime punishable by a fine of up to $10,000 and/or imprisonment for up to two years for an employee to participate in matters involving companies with whom he is negotiating or has any arrangement concerning prospective employment. Each year people are tried and convicted under this statute, and the Justice Department has noted that the statute is a convenient vehicle for prosecution since it does not require a showing of any quid pro quo, or any favored treatment bestowed upon the future employer by the government employee. The mere participation in matters involving the company on the job will subject the employee to criminal penalties.

About a year ago, a company which had lost out on an NADC contract submitted a bid protest to the General Accounting Office (GAO). The company was particularly upset because right about the time of contract award, one of the cognizant NADC engineers had left the government and gone to work for the company that won the contract. We investigated the matter and found that the engineer had had no involvement whatsoever with the procurement once he began negotiating with his prospective employer for a job. GAO concurred and the matter was closed. One thing this engineer could have done to help protect himself was to advise his supervisor as soon as he began negotiations with the company. Many employees are understandably reluctant to do this for fear of jeopardizing their government careers should the negotiations fall through. Nevertheless, keeping the supervisor apprised of any arrangements or negotiations for future employment can prove to be helpful in case allegations of an impropriety later arise.

"We always admire the other fellow more after we have tried his job."
—William Feather, businessman

"At a round table, there is no dispute about place."
—Italian proverb

Mixed bowling news

Congratulations to the **WARVEYHALLBANGERS** and the **BIG SPENDERS** for winning their Divisional Championships!

Bernie Weber's Warveys cruised to first place in the A Division, going into knockdown night with a 9 point lead over **Al Knobloch's** Goofers. In the B Division, things were a lot tighter. **Tom Reiter's** Red Winoes and **Sue Casagrande's** Big Spenders went head to head tied at 34.5, while **Helene Goldstein's** Eleventh Frame, at 34.0, had a shot, bowling **Ted Calkin's** Falcons. The Falcons stopped Eleventh Frames' bid by winning 3 games and revenge was truly sweet for the Big Spenders as their first year entry avenged an opening night, high handicapped, loss to the Wineos by crushing in the big one 3-1.

Good luck to all bowlers in the second half.

Naval Aviation — 75 years old

by Jim Kingston

This is going to be a banner year for Naval Aviation. NADC will be displaying banners and signs announcing the 75th Anniversary of Naval Aviation and an Open House at the Center.

The official Anniversary date of the establishment of Naval Aviation is May 8th, but the celebration will last all year long. For our part, we will be carrying the 75th Anniversary logo (design) in the nameplate of the *REFLECTOR*, on Public Affairs News Release stationery, and on our Center Video News programs.

We will be running a series of stories in the *REFLECTOR* on the history of Naval Aviation covering the 1911-1986 period. In addition, a special edition of Center Video News will be produced giving a capsule history of Naval Aviation. In each case, the contributions by NADC to Naval Aviation will be highlighted.

Our Open House celebration is scheduled for Saturday, May 10, 1986. Coincidentally, Warminster Township will be celebrating its 275th Anniversary and they will be supporting and complementing our Open House program much as they did during our 40th Anniversary in 1984. The open house will include our laboratories and the airfield. A static display of Naval Aircraft will include some vintage planes from private owners and collections.

VIEWPOINT

Photos by Regina Gasuk

This month's question is:

Do you warm up to cold weather sports?

"By a good warm-up in Bldg. 3, 2nd deck, preferably in the Public Affairs Office."

CAPT Fred Wright, Code 00A

"When I go skiing I stay warm by trying to fall down. My wife stays warm by laughing at me."

Phillip Whitney, Code 60B1

"Absolutely, as long as it's indoors. Especially if he provides a fireplace and a bottle of wine."

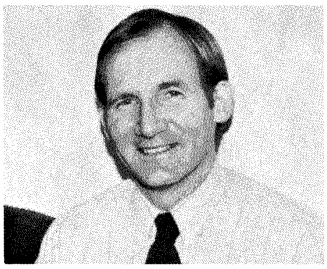
Carole Preston, Code 6001

"My idea of cold weather sports is jogging from my car to my house, although I love to take long walks when it snows. There's a certain magic in the air and I like to be a part of it."

Rosemary Convery, Code 302

"Although I'm very 'cool', I'm friendly, too, so I can warm up to almost everyone."

Glenn Carter, Code 201



"Sno', not really. But, I do like Polar Bars!"

Judy Scott, Code 034

"First, I give the wife a big hug, down a tall glass of Canadian moose milk, then strap on the skis and go for it!"

Major Dale Tremblay, Code 09L1

Welfare & Recreation entertains employees

The Choral Group, directed by Joel Lenko, performs favorite Christmas medley. Photo by Regina Gasuk

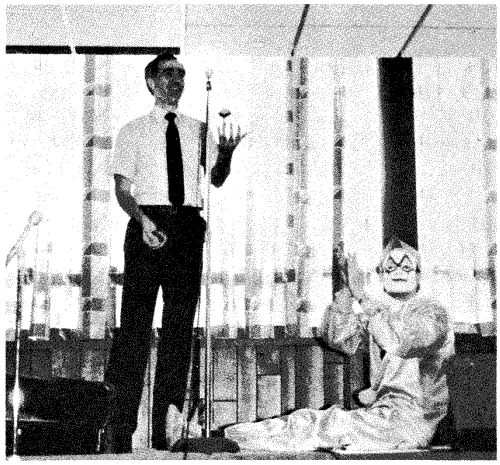
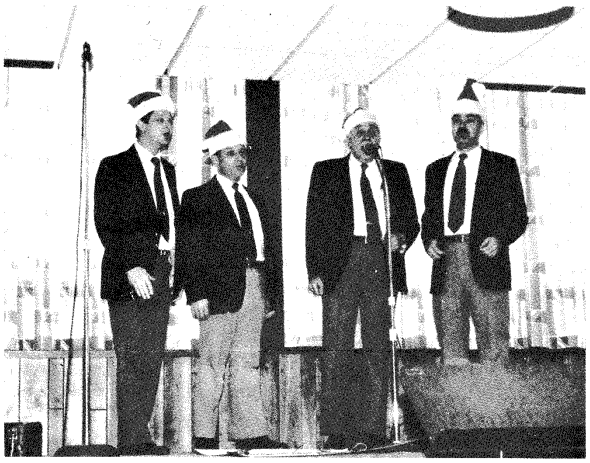


Photo by Regina Gasuk
George Gillespie performs magic and juggling act.



Barbershop Quartet harmonizes Yuletide carols. Photo by Regina Gasuk

Photo by Regina Gasuk
Lucy Dunbar (right) and her sister (Lydia Rodriquez) delight all with their rendition of "I'll be Home for Christmas."

Photo by Regina Gasuk
Evelyn James tells Santa (Otto Engdahl) what she wants for Christmas.

Photo by Regina Gasuk
Welfare & Recreation provide refreshments for after the show.

Technical Highlights

S-3B SOFTWARE DELIVERED FOR TECHEVAL

NADC delivered S-3B Fleet Issue software program B4.1to NAVAIR-TESTCEN on 1 Nov 85 for TECH-EVAL. The B4.1 software provides the S-3B aircraft with improved capability in ASW acoustic processing including passive tracking automation and advanced active capability, 99-channel receiving, and greater processing flexibility. ESM enhancements include expanded frequency coverage and auto threat warning. ASUW capability is improved with ISAR imaging, radar multi-fix auto tracking, and addition of the Harpoon Anti-Surface Missile.

SYNTHETIC APERTURE RADAR (SAR)

Installation design of a Multi-frequency and Polarization SAR has commenced. The radar system developed by the Environmental Research Institute of Michigan will be installed and operated in an NADC P-3. A five year ocean measurements research program will be undertaken by NADC and ERIM on behalf of the Navy when the installation is completed in September of 1986. P-3 Aircraft BuNo 148883 is being modified to accept the radar installation.

CRASHWORTHY RETROFIT AIRCREW SEATS, HELOS (CRASH)

H-53 Seat — Prototype hardware of the H-53 seat concept was successfully qualified to the requirements of MIL-S-81771A. Qualification testing included: static loads; ballistics; restraint subsystem/static loads; environmental; and dynamic crash loads. The dynamic crash loads test phase was conducted on the NADC Horizontal Accelerator Facility. This test series marks the initial use of this unique R&D mechanism in providing NAVAIR with an independent crash test facility for qualification.

TACAMO POWER AMPLIFIER ADM DELIVERED

NADC accepted delivery of a unique 36 kilowatt Advanced Development Model (ADM) solid state Very Low Frequency (VLF) power amplifier demonstration unit. This unit was developed by the Westinghouse Electric Corporation under contract to NADC and demonstrates the feasibility of using solid state components to build state-of-the-art, high power replacement VLF amplifiers for the TACAMO communication system. These new technology amplifiers will eventually replace the tube type power amplifiers currently in the TACAMO aircraft and will be much more reliable and electrically efficient as well as substantially lighter in weight. The demonstration unit will be laboratory tested at NADC and the findings will be used in the preparation of a specification for Full Scale Development.

P-3C OPERATIONAL PROGRAM COMMENCES OPEVAL

The I4.6.1 Operational Program, which successfully completed Navy Technical Evaluation (NTE) in July 1985, has been released for OPEVAL beginning 12 November 1985. This program will provide the P-3C UPDATE fleet aircraft with the ability to operate SASP in the UPDATE III, PTA/Localization in the UPDATE II, and provide HARPOON Targeting Aids, new weapon inventories and mining capabilities in UPDATE II and III. The program is currently scheduled for fleet release in March 1986.

Children Suffering From Flu Should Not Take Aspirin

"Aspirin should not be given to children or teen-agers when they have flu-like symptoms," stressed Lt. Cmdr. (Dr.) Joel Rosenstock, assistant professor of preventive medicine and biometrics and assistant professor of medicine at the Uniformed Services University of the Health Sciences, the nation's only military medical school.

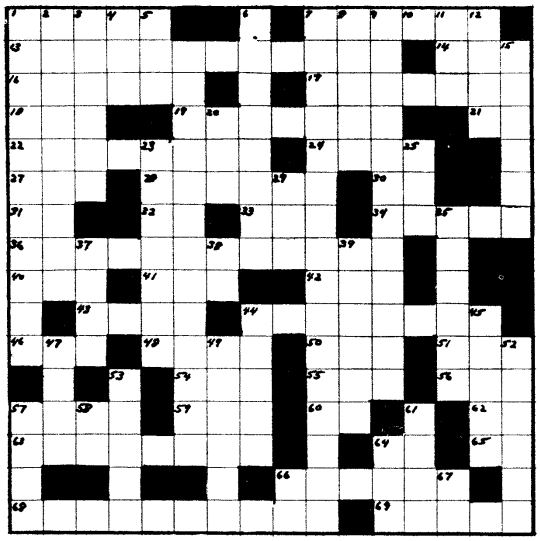
"There is a possible association between aspirin and Reye's syndrome—a potentially fatal illness that leads to a sudden deterioration of the brain and liver."

Reye's syndrome can affect people up to age 20, but Rosenstock pointed out it occurs mainly in children under 12. "Reye's syndrome brings about neurological changes," said Rosenstock. "The symptoms are dizziness and protracted vomiting." Mothers should be cautioned that an episode of intractable vomiting after the onset of flu is reason to seek a doctor's care, said Rosenstock. There is no real treatment for Reye's syndrome, and 10 to 15 percent of the victims die.

Acetaminophen (brand names: Tylenol, Liquiprin, Tempra and Datril) is generally considered safe for children as a fever control, advised Rosenstock. Acetaminophen has not been linked to Reye's syndrome.

Does safety puzzle you?

By Mike Masington



(Solution on page 9)

ACROSS

1 & 7 Former character in this paper
13. Poor type of safety lecturer
14. _____ relief
16. Common safety warning
17. Sugary candy
18. Partner of meini & mo
19. Most common form of auto accident
21. Ends a fight
22. Possible result of chemical over-exposure
24. High risk driver
27. British vessel
28. Everything ___ ___ (OK)
30. Concerning (abbr.)
31. Girlfriend of Zeus
32. Army cop
33. Felon on the run
34. A good driver _____ his time before passing
36. May be effected by 40 across
40. Dangerous hallucinogen
41. Single
42. Actual percentage of good drivers in U.S.
43. Don't gamble with your safety, the _____ are against you
44. Common problem on ice
46. International distress signal
48. Source of highway information
50. Compete
51. Barrel
54. Male relative (abbr.)
55. Board convened to investigate aircraft accidents (abbr.)
56. Saves downed pilots (abbr.)
57. Demonstrate
59. Source of traffic regulations
60. Female star of Gilligan's island (initials)
62. Greek letter
63. Type of person who causes accidents
64. Short greeting
65. Compass point
66. Type of society the auto makes us
68. Happens to some behind the wheel
69. Instruct

DOWN

1. Attached to safety glasses for added protection
2. Support for safety should be _____
3. A fire victim often _____
4. Unit of energy
5. Route (abbr.)
6. Signal a lead singer (3 wds.)
7. Everyone should have it (2 wds.)
8. Make amends
9. Minor auto accident
11. Not yet scheduled (abbr.)
12. American in Britain
15. Bone breakers
20. Engineering service report (abbr.)
23. British ASW airplanes
25. Never in Berlin
29. British commando group
35. A good driver never _____ and drives
37. Officers on night watch
38. Pronoun
39. Safety barrier dividing traffic lanes
44. They cause traffic problems in winter
45. Require guards when exposed on machines
47. Safety regulatory agency
49. A good driver _____ the steering wheel firmly
52. Violating safety rules may permanently stunt your _____
53. Common reaction of a driver being cut out in traffic
57. Often a souvenir of an accident
58. Preposition
61. Stack
64. Driving shouldn't be a _____ or miss proposition
66. Missouri (abbr.)
67. Each (abbr.)

Heating Energy Savers

Don't turn the heat on until you have to. On cool evenings use your fireplace instead and add a blanket at night.

When the heat is on . . .

- **Lower your thermostat to 65°F during the day and 55°F at night.** You can save on your fuel costs for every degree you reduce the *average temperature* in your home.
- **Clean or replace the filter in your forced-air heating system each month.**
- **Keep windows near your thermostat tightly closed,** otherwise it will keep your furnace working after the rest of the room has reached a comfortable temperature.

Helpful Hints

The human body gives off heat, about 390 BTU's per hour for a man, 330 for a woman. Dressing wisely can help you retain natural heat.

Wear closely woven fabrics. They add at least a half degree in warmth.

For women. Slacks are at least a degree warmer than skirts.

For men and women. A light long-sleeved sweater equals almost 2 degrees in added warmth; a heavy long-sleeved sweater adds about 3.7 degrees; and two lightweight sweaters add about 5 degrees in warmth because the air between them serves as insulation to keep in more body heat.