

# **Navy Officer Technical Expertise**

David M. Rodney

**Center for Naval Analyses**

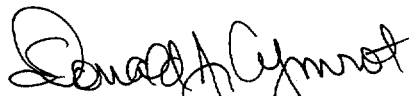
4401 Ford Avenue • P.O. Box 16268 • Alexandria, VA 22302-0268

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A handwritten signature in black ink, appearing to read "Donald J. Cymrot". The signature is stylized with a large, looping "D" and "C".

Donald J. Cymrot, Director  
Manpower and Medical Program  
Acquisition and Support Division

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## **Background**

**At least some retired Navy flags believe that:**

- **The Navy is a technically driven service, both in operations and acquisition**
- **The requirements for technically qualified officers and civilians are little understood and poorly quantified**
- **Technical knowledge and experience has become less important for career progression in today's Navy than the Navy of a generation (or more) ago**
- **The capability of the U.S. Navy is threatened by this decline in technical expertise**

VAdm. Doyle, USN (Ret.) and RAdm. Meyer, USN (Ret.), among others, have expressed concern to Adm. Kelso, the Chief of Naval Operations, regarding the technical expertise of Navy officers. Their concern is that the decline in officer technical expertise is harming the acquisition process and threatening the capabilities of the U.S. Navy. Adm. Kelso asked CNA to study the issue, and this briefing describes our analysis.

## **This is not a new issue**

**The 1962 DON Dillon Board review of Navy management found the following:**

- **“The Navy has not yet worked out a logical career pattern of technical subspecialization”**
- **“Many officers believe duty in key technical positions in bureaus and shore activities adversely affects promotion opportunity to flag rank”**

The starting point for our analysis was a historical review of the issues. First, we present the unsurprising observation that this is not a new issue: various people and organizations have expressed concerns regarding technical expertise in the Navy officer corps for many years.

## **What happened in the past?**

**Top Navy officers, such as Adm. Kidd and Adm. Whittle, frequently had a mix of operational tours and technical assignments in the materiel commands.**

**Such officers provided three essential ingredients to Navy operations:**

- 1. Operationally current and technically knowledgeable leadership throughout the acquisition process**
- 2. Cross-fertilization of ideas from operational to materiel commands**
- 3. A cadre of technically competent operators**

The people raising this issue compare today's Navy to the Navy of a generation or more ago, and make a variety of observations regarding the Navy of yesteryear:

1. The Navy of a generation (or more) ago did not exhibit a lack of prestige for jobs in materiel commands.
2. Top rated officers often moved between operational tours and materiel commands during the course of their careers.
3. Such movement was and still is necessary for the continued excellence of the U.S. Navy.

## **What happens today?**

**Goldwater-Nichols/Acquisition Reform has changed the process in the following ways:**

- **Acquisition execution added to oversight in Navy Secretariat**
- **Much less interaction between OPNAV and materiel commands**
- **Budget execution is separated from requirements generation**
- **Joint-duty requirements have inhibited the ability of upwardly mobile officers to have tours in materiel commands**
- **Technical competence is prized solely in the acquisition process**

Legislative reforms had made a major impact on the acquisition process during the past ten years. Responsibilities have become compartmentalized. In addition, communications between OPNAV and the materiel commands have lessened, according to the views of many knowledgeable people. The Navy's response to these legislative reforms is still evolving as the Navy seeks day-to-day operations that provide efficient acquisition management under the new laws.

A key point in this evolution is that acquisition is an iterative process: nobody designs a weapon system completely right the first time. Modifications are an integral part of the development process. Legislative reforms have hindered such iterations by compartmentalizing responsibilities.

## **What is at issue?**

- **Has the technical expertise of the Navy diminished over time?**
- **How well is technical expertise being used in the acquisition process?**
- **What effect has the separation of requirement generation and acquisition had on the quality of decisions?**
- **What scope is there for senior acquisition officers to have both materiel expertise and line experience?**
- **Can the Navy afford to rely on private sector technical expertise or must it retain home-grown expertise?**

A variety of issues surround the broad concerns discussed in earlier slides. These issues provided impetus for CNA analysis. We have addressed three of the above questions:

1. Has the technical expertise of the Navy diminished over time?
2. How well is technical expertise being used in the acquisition process?
3. What scope is there for senior acquisition officers to have both materiel expertise and line experience?

## **Exploratory data analysis**

The remainder of the briefing describes the results of our empirical analysis. CNA maintains historical personnel and billet files. We made use of these files to discern trends regarding:

- Number of billets in the acquisition arena
- Numbers of officers with technical expertise
- Career paths and prospects of such officers.

## **Summary**

**There is little evidence of a decline in technical expertise in the officer corps**

- **There is a slight disproportional decline in the size of the engineering duty officer (EDO) community**
- **There are higher than average numbers of fail selectees among officers at materiel billets**

***but***

- **Graduate engineering education is stable for the entire Navy, and rising in the EDO community and for officers at materiel billets**
- **Officers move between sea duty and materiel billets**
- **Retention of officers receiving graduate engineering degrees is higher than ALNAV rate**

In summary, there are no strong indications that the Navy has a problem regarding technical expertise in the officer corps. Our analysis indicated a number of comparatively minor concerns. Our analysis, however, did not go into great detail, and it is possible that a finer grained analysis would uncover some more problems. The following broad trends are clear:

- The number of officers with graduate engineering degrees is stable.
- Such officers have high retention rates.
- Officers are moving between materiel commands and sea duty.

## Inventories

|                            | <u>1976</u>     | <u>1986</u>     | <u>1993</u>     | <u>1998</u><br><u>(planned)</u> |
|----------------------------|-----------------|-----------------|-----------------|---------------------------------|
| • <b>MPs</b>               | –               | 228<br>(0.3%)   | 236<br>(0.4%)   | 200<br>(0.4%)                   |
| • <b>EDOs</b>              | 1,310<br>(2.2%) | 1,344<br>(2.0%) | 1,120<br>(1.8%) | 900<br>(1.6%)                   |
| • <b>AEDOs &amp; AMDOs</b> | 748<br>(1.2%)   | 1,049<br>(1.6%) | 1,039<br>(1.7%) | 900<br>(1.6%)                   |
| • <b>All officers</b>      | 60,363          | 66,392          | 62,105          | 56,000                          |

We began our empirical analysis by looking at how officer inventories have changed over time. We analyzed officer master files for 1976, 1986, and 1993. In addition, we considered planned inventories for 1998. We focused on the officer communities directly concerned with acquisition: materiel professionals (MPs), engineering duty officers (EDOs), aviation engineering duty officers (AEDOs), and aviation maintenance duty officers (AMDOs).

On the positive side, note that in 1976 the Navy did not have any MPs, and the relative size of AEDOs and AMDOs has grown since 1976. On the negative side, we observe the plan for disproportional decline in the EDO community during the next five years.

## Graduate degrees

|                          | <u>1976</u>  | <u>1986</u>  | <u>1993</u>  |
|--------------------------|--------------|--------------|--------------|
| <b>MPs</b>               |              |              |              |
| • Science                | —            | 26 (11%)     | 32 (14%)     |
| • Engineering            | —            | 61 (27%)     | 70 (30%)     |
| • All degrees            | —            | 163 (72%)    | 178 (75%)    |
| <b>EDOs</b>              |              |              |              |
| • Science                | 92 ( 7%)     | 92 ( 7%)     | 63 ( 6%)     |
| • Engineering            | 746 (57%)    | 811 (60%)    | 837 (75%)    |
| • All degrees            | 967 (74%)    | 955 (71%)    | 942 (84%)    |
| <b>AEDOs &amp; AMDOs</b> |              |              |              |
| • Science                | 27 ( 4%)     | 50 ( 5%)     | 44 ( 4%)     |
| • Engineering            | 236 (32%)    | 235 (22%)    | 216 (21%)    |
| • All degrees            | 378 (51%)    | 491 (47%)    | 498 (48%)    |
| <b>All officers</b>      |              |              |              |
| • Science                | 1,899 ( 3%)  | 1,408 ( 2%)  | 1,243 ( 2%)  |
| • Engineering            | 2,867 ( 5%)  | 3,001 ( 5%)  | 3,265 ( 5%)  |
| • All degrees            | 16,486 (27%) | 16,637 (25%) | 18,220 (29%) |

We then turned our attention to officer graduate education. We focused on officers with a graduate degree in either engineering or a physical science.

ALNAV trends over the past 20 years are fairly clear:

- The percentage of officers with an engineering graduate degree has remained constant.
- There has been a decline in the percentage of officers with a science graduate degree.
- The extent of overall graduate education has remained comparatively stable.

The acquisition-related communities have a large number of officers with graduate engineering or science degrees, as one might expect. Trends in these communities show an increase in EDO graduate education and a stable level in the other communities.

We should note that our EDO, AEDO, and AMDO inventories include trainees for these communities. Full members of these communities are supposed to have graduate degrees. The trainees may be completing their graduate education. So, our numbers underrepresent the percentage of fully qualified EDOs, AEDOs, and AMDOs who have graduate degrees.

## Materiel experience for URL flags

|       | <u>Serving in materiel billets</u> |                       | <u>Previous materiel duty<sup>1</sup></u> |                       |
|-------|------------------------------------|-----------------------|-------------------------------------------|-----------------------|
|       | <u>1972</u>                        | <u>1993</u>           | <u>1972</u>                               | <u>1993</u>           |
| O-10  | 1 (11%)                            | 1 (10%)               | 0                                         | 0                     |
| O-9   | 0                                  | 0                     | 6 (13%)                                   | 3 (14%)               |
| O-8   | 5 ( 5%)                            | 5 ( 9%)               | 21 (22%)                                  | 13 (22%)              |
| O-7   | <u>6 ( 5%)</u>                     | <u>8 ( 9%)</u>        | <u>26 (22%)</u>                           | <u>15 (17%)</u>       |
| Total | 12 ( 4%)                           | 14 ( 8%) <sup>2</sup> | 53 (20%)                                  | 28 (16%) <sup>3</sup> |

<sup>1</sup> Any of seven previous tours.

<sup>2</sup> Includes 12 MPs.

<sup>3</sup> Includes 14 MPs.

It is instructive to examine the experience of unrestricted line (URL) flag officers in materiel billets.

An initial observation is that proportionately more URL flag officers are in a materiel billet today than was the case 20 years ago.

We also examined how many URL flag officers served in a materiel billet in any of their previous seven tours. This may provide some indication of the extent of materiel duty in the career paths of successful URL officers. The data show a decline in the extent of previous materiel duty for junior flag officers. It is unclear whether this is a random fluctuation or a true change in behavior.

## 1993 billets at materiel UICs<sup>1</sup>

| <u>Grade</u> |            |            |            |            |            |             | <u>Total</u> |
|--------------|------------|------------|------------|------------|------------|-------------|--------------|
| <u>O-1</u>   | <u>O-2</u> | <u>O-3</u> | <u>O-4</u> | <u>O-5</u> | <u>O-6</u> | <u>O-7+</u> |              |
| 25           | 106        | 858        | 952        | 732        | 431        | 48          | 3,152        |

| <u>Community</u> |              |
|------------------|--------------|
| URL (not MPs)    | 872          |
| MPs              | 114          |
| EDOs             | 628          |
| AEDOs & AMDOs    | 312          |
| Other            | <u>1,226</u> |
| <b>Total</b>     | <b>3,152</b> |

<sup>1</sup> List of UICs provided by VAdm. Rowden.

Our analysis continued by considering officers at materiel UICs. VAdm. Rowden, USN (Ret.) provided us with a list of acquisition-related UICs. This list provided the basis of our analysis for this slide and the next five slides.

As one would expect, a large number of the materiel UIC billets are for MPs, EDOs, AEDOs, and AMDOs.

### **Officers with graduate degrees on board at materiel UICs**

| <b><u>Discipline</u></b>  | <b><u>1975</u></b>     | <b><u>1981</u></b>     | <b><u>1987</u></b>     | <b><u>1993</u></b>     |
|---------------------------|------------------------|------------------------|------------------------|------------------------|
| <b>Engineering</b>        | <b>784<br/>(26%)</b>   | <b>811<br/>(27%)</b>   | <b>860<br/>(27%)</b>   | <b>931<br/>(32%)</b>   |
| <b>Physical sciences</b>  | <b>102<br/>( 3%)</b>   | <b>155<br/>( 5%)</b>   | <b>148<br/>( 5%)</b>   | <b>129<br/>( 4%)</b>   |
| <b>Other</b>              | <b>577<br/>(19%)</b>   | <b>605<br/>(20%)</b>   | <b>727<br/>(23%)</b>   | <b>685<br/>(23%)</b>   |
| <b>No graduate degree</b> | <b>1,568<br/>(52%)</b> | <b>1,486<br/>(49%)</b> | <b>1,452<br/>(46%)</b> | <b>1,187<br/>(40%)</b> |
| <b>Total on board</b>     | <b>3,031</b>           | <b>3,057</b>           | <b>3,187</b>           | <b>2,932</b>           |

The education level for officers on board at materiel UICs appears fine. Sixty percent of all officers have a graduate education. In addition, there has been an upward trend in graduate engineering education; more than one-quarter of the officers have such a degree.

## Promotion status of officers at materiel UICs

|                             | 1975  | 1981 | 1987 | 1993 |
|-----------------------------|-------|------|------|------|
| • O-5s                      |       |      |      |      |
| – fail selectees            | 155   | 103  | 126  | 152  |
| – total on board            | 685   | 754  | 806  | 789  |
| – % fail selectee           | 23%   | 14%  | 16%  | 19%  |
| • ALNAV O-5 % fail selectee | 16%   | 13%  | 15%  | 16%  |
| • O-4s                      |       |      |      |      |
| – fail selectees            | 251   | 202  | 229  | 260  |
| – total on board            | 1,034 | 867  | 942  | 850  |
| – % fail selectee           | 24%   | 23%  | 24%  | 31%  |
| • ALNAV O-4 % fail selectee | 15%   | 17%  | 16%  | 9%   |

Promotion statistics for officers at materiel UICs cause some concern. There are clearly a larger than average number of “passed over” officers at these activities. However, the cause for this situation may not have direct bearing on the “desirability” of a tour at a materiel UIC. There are relatively few sea duty billets for failed-to-select O-4s and O-5s. Consequently, a large percentage of such officers will be found on shore duty, raising the number of fail selectees at most shore activities.

It is difficult to interpret the variations over time in the percentages of fail-selectees. Promotion rates have varied considerably during the past 20 years, and we currently have low promotion opportunity due to strength reductions. Such variations in promotion rates have long-lasting effects on the numbers of fail selectees.

## **Previous tour for officers at materiel UICs**

|                         | <u>1975</u>  | <u>1981</u>  | <u>1987</u>  | <u>1993</u>  |
|-------------------------|--------------|--------------|--------------|--------------|
| <b>Sea duty</b>         | <b>1,136</b> | <b>1,082</b> | <b>1,250</b> | <b>1,212</b> |
| <b>Materiel duty</b>    | <b>329</b>   | <b>525</b>   | <b>521</b>   | <b>535</b>   |
| <b>Other shore duty</b> | <b>1,381</b> | <b>1,186</b> | <b>1,298</b> | <b>1,135</b> |
| <b>N/A</b>              | <b>185</b>   | <b>264</b>   | <b>118</b>   | <b>50</b>    |
| <b>Total</b>            | <b>3,031</b> | <b>3,057</b> | <b>3,187</b> | <b>2,932</b> |

- **Many officers come to materiel duty from sea duty**

We next turn our attention to the careers of officers serving at materiel UICs. We initially addressed the the issue of whether officers are coming directly from sea duty to materiel UICs, and thus bringing fresh operational experience into the acquisition arena. The data are rather consistent over time: between 35 and 40 percent of officers at materiel UICs had their previous tour on sea duty.

## Six-year retention of officers at materiel UICs

|                                               | <u>1975</u>  | <u>1981</u>  | <u>1987</u>  |
|-----------------------------------------------|--------------|--------------|--------------|
| <b>On board</b>                               | <b>3,031</b> | <b>3,057</b> | <b>3,187</b> |
| <b>On active duty six years later</b>         | <b>1,224</b> | <b>1,602</b> | <b>1,379</b> |
| <b>Retention rate</b>                         | <b>40%</b>   | <b>52%</b>   | <b>43%</b>   |
| <b>Comparable ALNAV retention<sup>1</sup></b> | <b>45%</b>   | <b>56%</b>   | <b>50%</b>   |

<sup>1</sup> Weighted for same grade distribution.

Retention rates are a good way of measuring a successful career. Officers who are promoted tend to remain on active duty and vice versa. In addition, retention is a good measure of officer satisfaction with a Navy career.

We tracked officers over six years from the time they were on board at materiel UICs and computed their retention rates. The six-year period provides enough time to allow for promotion and obligated service effects. The statistics show that officers at materiel UICs have lower retention rates than the ALNAV average. The difference in rates is likely due to the large numbers of fail selectees on board at materiel UICs.

## **Subsequent tour for officers on board at materiel UICs**

|                         | <u>1975</u>       | <u>1981</u>       | <u>1987</u>       |
|-------------------------|-------------------|-------------------|-------------------|
| <b>Sea duty</b>         | <b>342</b>        | <b>361</b>        | <b>361</b>        |
| <b>Materiel duty</b>    | <b>227</b>        | <b>322</b>        | <b>350</b>        |
| <b>Other shore duty</b> | <u><b>655</b></u> | <u><b>919</b></u> | <u><b>668</b></u> |
| <b>Total</b>            | <b>1,224</b>      | <b>1,602</b>      | <b>1,379</b>      |

- Numerous officers go from materiel duty to sea duty

We then examined the careers of officers after they complete tours at a materiel UIC. Between 20 and 30 percent of such officers go to sea duty. It is hard to say what is a desirable or optimal level of movement between materiel UICs and sea duty. However, it is clear that many officers do, indeed, move between these types of duty.

## **Officers having received graduate engineering or physical science degrees within two years**

|               | <u>1975</u> | <u>1981</u> | <u>1987</u> | <u>1993</u> |
|---------------|-------------|-------------|-------------|-------------|
| URL           | 317         | 185         | 243         | 335         |
| EDOs          | 38          | 77          | 112         | 91          |
| AEDOs & AMDOs | 14          | 6           | 6           | 20          |
| Other         | <u>91</u>   | <u>92</u>   | <u>10</u>   | <u>19</u>   |
| Total         | 460         | 360         | 481         | 565         |

- Graduate technical education has risen in the last ten years

Next, we turned our attention to trends in graduate education. Here we show how many officers have been receiving graduate technical degrees. In subsequent slides, we describe their careers after they complete graduate education.

This slide displays the number of officers who had received a graduate engineering or physical science degree within a two-year time frame of certain fixed points in time. For example, 317 URL officers received such a degree within the two-year period preceding the end of fiscal year 1975. The data show that the level of graduate technical education has risen during the past ten years.

## **Duty for officers having received graduate engineering or physical science degree within two years**

|                         | <u>1975</u> | <u>1981</u> | <u>1987</u> | <u>1993</u> |
|-------------------------|-------------|-------------|-------------|-------------|
| <b>Sea duty</b>         | <b>181</b>  | <b>117</b>  | <b>162</b>  | <b>223</b>  |
| <b>Materiel duty</b>    | <b>46</b>   | <b>72</b>   | <b>105</b>  | <b>115</b>  |
| <b>Other shore duty</b> | <b>233</b>  | <b>171</b>  | <b>214</b>  | <b>227</b>  |
| <b>Total</b>            | <b>460</b>  | <b>360</b>  | <b>481</b>  | <b>565</b>  |

- **Technically educated officers are serving duty throughout the Navy**

Officers accrue obligations for "pay back" tours upon completion of graduate education. So, it is of interest to view the types of duty officers are serving shortly after completing a technical graduate degree. This slide shows that such officers are serving duty throughout the Navy. In addition, the number of such officers on duty at materiel UICs has risen considerably during the 1975 to 1993 time period.

## **Six-year retention of officers receiving graduate engineering or physical science degrees**

|                                    | <u>1975-1981</u> | <u>1981-1987</u> | <u>1987-1993</u> |
|------------------------------------|------------------|------------------|------------------|
| <b>URL</b>                         | <b>60%</b>       | <b>83%</b>       | <b>79%</b>       |
| <b>EDOs</b>                        | <b>63%</b>       | <b>68%</b>       | <b>69%</b>       |
| <b>AEDOs &amp; AMDOs</b>           | <b>64%</b>       | <b>83%</b>       | <b>81%</b>       |
| <b>Other</b>                       | <b>60%</b>       | <b>77%</b>       | <b>70%</b>       |
| <b>ALNAV retention<sup>1</sup></b> | <b>48%</b>       | <b>64%</b>       | <b>56%</b>       |

<sup>1</sup> Weighted for same grade distribution.

- **The Navy is retaining technically trained officers.**

We concluded our analysis by turning our attention to the retention of officers who complete graduate education in either an engineering or physical science discipline. The data show that these officers have much higher retention than ALNAV averages. By tracking such officers for six years, we have gone beyond the time limit of any service obligations accrued as a result of receiving graduate education. Clearly, the Navy values such officers and must be treating them well.

## **Possible topics for CNA study**

- **Develop and analyze options for career paths and other distribution policies of acquisition officers.**
- **Document evolution of the roles of Secretariat, OPNAV, and SysComs in the acquisition process. Show impacts of reforms on the various players.**
- **Study the technical education and training requirements for both officers and civilians.**

The briefing has shown that there are no strong indications of a problem in technical expertise in the Navy officer corps. However, a number of issues that we have not examined are germane to this discussion and are possible topics for CNA study.

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