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The Effects of Shore Billets on Aegis Fire Controlman Retention and Promotion

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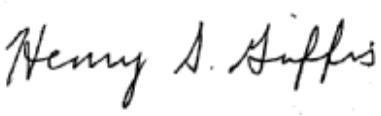

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Executive summary

Aegis Fire Controlmen (FC(A)) are some of the most highly trained and highly skilled Sailors in the Navy. They run Aegis, the Navy's most modern surface combat system. It was designed and developed as a complete system, integrating state-of-the-art radar and missile systems.[1] It is the main surface combat system designed to defend against all missile threats to Navy ships, including antiair, antisurface, and antisubsurface threats. The Navy is concerned about the performance of Aegis, and is studying all manpower, personnel, training, and education (MPT&E) issues related to Aegis-qualified Sailors.

The FC(A) community is currently undermanned, especially at sea. The undermanning has occurred largely because the Navy accessed Sailors to fill total billets, which were too few due to a shortage of FC(A) shore billets.

The Navy is now investigating which shore billets to add to the FC(A) subcommunity. It wants to have enough shore billets to accommodate projected sea-shore rotation needs. However, the Navy is concerned that adding non-FC related shore billets will decrease readiness and retention. It is especially concerned about nontechnical, nonleadership billets outside the FC(A) community.

To assist in this investigation, CNA studied the effects of shore billets on retention and promotion of FC(A) Sailors. We used regression analysis to determine whether better Sailors are assigned to certain billets or whether certain billets improve the retention and promotion prospects of the Sailors who fill them.

1. The source is http://www.GlobalSecurity.org.

Findings

From a sample of enlisted personnel who served a non-TPPH[2] shore tour after a sea tour following FC(A) qualification, we find that:

- Those who served in a continental United States (CONUS) noninstructor, non-high-skill billet had relatively poor retention to 123 months and promotion rates to E-6 by 109 months.
- Those serving in some other types of billets had better promotion to E-6 by 109 months by various amounts:
  - — Instructors of FC-related material: 17.8 percentage points more likely to promote
  - — Other instructors: 15.1 percentage points more likely to promote
  - — Recruiters: 13.5 percentage points more likely to promote
  - — Other high-skill billets and other outside-CONUS (OCONUS) billets: neither more nor less likely to promote
- Those serving in some other types of billets had better retention to 123 months:
  - — Non-FC instructors: 23.1 percentage points more likely to retain
  - — Recruiters: 20.8 percentage points more likely to retain
  - — Other OCONUS: 28.8 percentage points more likely to retain
  - — High-skill billets (instructor and noninstructor): neither more nor less likely to retain.

On one hand, the promotion results suggest that instructors and recruiters build skills and / or are more highly valued by the Navy. On the other hand, Sailors in other high-skill billets do not promote at a higher rate than Sailors in other CONUS billets, suggesting that Sailors in other high-skill billets do not build skills in their shore billets

2. TPPH stands for transients, patients, prisoners, and holdees.

that make them much more competitive than Sailors serving in other billets.

Our retention results suggest that the effect of FC(A) shore billets on retention is unclear. The types of shore billets (non-FC instructors, recruiters, and other OCONUS billets) that are correlated with the highest levels of retention are those with the least number of Sailors. It is possible that these types of billets are more satisfying to Sailors and make them more likely to stay in the Navy. It is also possible that those choosing to serve in such billets do so because they have a greater enjoyment of and investment in Navy life, and wish to spend time at shore overseas, promoting the Navy as recruiters or serving to train new recruits (or similar jobs) as non-FC instructors.

Implications and recommendations

Our work points to a couple of key recommendations for managing FC(A) shore requirements:

- The Navy should pursue a mixed strategy for managing its FC(A) community:
  - — Continue to aggressively pursue sea duty incentives, such as the new Sea Duty Incentive Pay (SDIP).
  - — Remilitarize instructor billets as needed, if more than sea duty incentives are necessary to achieve the needed sea/shore balance.
- The Navy should allow willing FC(A) Sailors to serve in recruiter, OCONUS, or non-FC instructor billets. Sailors serving in these billets have high retention rates, and recruiters and non-high-skill instructors have high promotion rates as well, suggesting that these billets are good shore billets for FC(A) Sailors.

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Introduction

Aegis Fire Controlmen and their importance to the Navy

FC(A) Sailors run Aegis, which is the Navy's most modern surface combat system. It was designed and developed as a complete system, integrating state-of-the-art radar and missile systems. It is the main surface combat system designed to defend against all missile threats to Navy ships—antiair, antisurface, and antisubsurface.

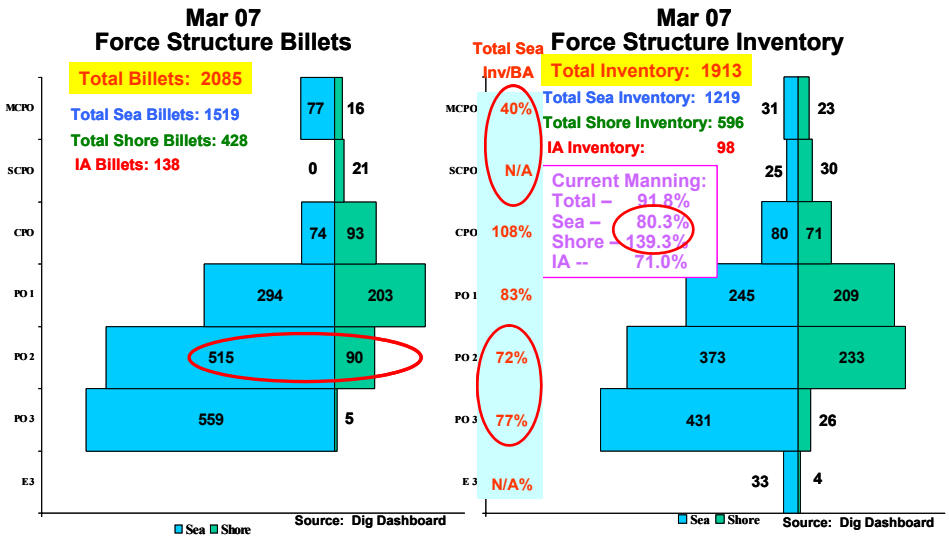
The ability to defend itself is central to a modern navy, and the U.S. Navy has had concerns about the performance of its Aegis system. Because of these concerns, the Navy created an FC(A) Manpower, Personnel, Training, and Education Action Group, which included people from all parts of the Navy and was tasked to investigate all the MPT&E issues that might limit Aegis performance.

FC(A) Sailors are among the most highly trained Sailors in the Navy. Before going out to sea, they receive more than a year of initial training (Recruit Training, A-School, and C-School) and, therefore, have 6-year initial obligations.

The Navy is very concerned that it doesn't have enough FC(A) Sailors to man the Aegis system, possibly leading to declines in Aegis system performance. Figure 1 shows the current distribution of FC(A) Sailors and billets. As of March 2007, there is a small shortage of FC(A) Sailors, and a significant shortage of FC(A) Sailors at sea.

The large shortage of FC(A) Sailors at sea, especially at E-5, worries Navy officials. One of the major tasks of the FC(A) Action Group has been to study ways to make sure that FC(A) billets at sea are filled. There are several ways to fill more FC(A) billets at sea. We describe four in the paragraphs that follow.

Figure 1. FC Aegis paygrade structures



One way to fill more FC(A) billets at sea is to *increase the number of accessions.* This is most appropriate if the shortages are before the Initial Service Obligation (ISO) or if the billet profile is such so that it would be impossible (or extremely difficult or expensive) to retain enough Sailors to fill billets after the ISO [1].

A second method is to *increase retention*. This is appropriate in this case because most of the at-sea shortages are at the E-5 level, and half of FC(A) Sailors who make E-5 do so between 43 and 58 months, with 80 percent of FC(A) Sailors reaching E-5 between 36 and 67 months. Most FC(A) Sailors (about 80 percent) don't reach E-6 until 73 to 121 months, and FC(A) Sailors usually reach E-6 between 85 and 108 months. This means that most of the time Sailors spend at E-5 is after they reenlist, and increased retention could help E-5 shortages. At the same time, much of Sailors' time as E-5s is spent on shore tours, limiting the effect of increased retention on E-5 shortages.

Extending the initial sea tour is a third way to fill more FC(A) billets at sea. Several years ago, the Navy extended the FC(A) Sailor initial sea tour from 54 to 60 months so that FC(A) Sailors would spend more time at sea. The current 60-month initial sea tour means that FC(A)

Sailors stay at sea until their ISO ends. On reenlisting, Sailors usually move to a shore tour. Extending the initial sea tour would likely affect retention if not accompanied by additional incentives.

A fourth method is to *increase the fraction of Sailors who choose to stay at sea*. This can be done via monetary or nonmonetary incentives. Nonmonetary incentives could include homesteading and/or greater choice of assignments, as well as increased time off. Monetary incentives would be bonuses targeted to keep FC(A) Sailors at sea longer. The Navy has just approved Sea Duty Incentive Pay (SDIP), which will be targeted at shortages in specific rating/paygrade groups. It can be offered for up to $500/month in additional pay to eligible Sailors.

To fill more FC(A) sea billets, the Navy will need to choose one (or a combination) of the four options just described.

How too few shore billets can lead to FC(A) shortages at sea

No matter which option the Navy chooses to fix its FC(A) shortages at sea, it must also make sure that there are enough shore billets for sea-shore rotation. In the past, the Navy aggressively protected sea-shore rotation. However, budgetary pressures have led the Navy to civilianize and/or contract out more military billets. At times, this has led to too few shore billets for sea/shore rotation. The FC(A) community is an extreme example of this because it has long suffered from a severe shortage of shore billets (see table 1).

Table 1. FC(A) billets over time

Billet	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Sea	1,362	1,376	1,427	1,393	1,412	1,475	1,373	1,385	1,400	1,550
Shore	658	659	659	602	605	579	607	640	624	570

In previous years, the Navy accessed enough FC(A) Sailors to make sure that there were enough to fill sea billets. This meant that there were more FC(A) Sailors at shore than billets for them to fill. However, this leads to paying for more FC(A) Sailors than requirements would dictate. Several years ago, the Navy reduced accessions to

match the overall number of billets in the community, rather than the overall number of sea billets. As a result, the Navy now has a shortage of FC(A) Sailors at sea (refer back to figure 1).

The Navy currently plans to correct the shortage of FC(A) shore billets by both offering monetary incentives to extend sea tours (SDIP, $500 per month) and adding FC(A) shore billets. By doing this, the Navy will then allot the correct amount of money to pay for all the FC(A) Sailors needed to man all of its ships at sea. But which shore billets should the Navy add?

The Navy has a large number of enlisted shore billets. Many of these positions, including recruiting, don't require a certain skill set and can be filled by Sailors from any rating. The Navy is concerned that having FC(A) Sailors serve in these billets will decrease retention and erode their skills. It is difficult to measure the cost of skill degradation, but decreased retention has a clear cost. Lower retention means that the Navy has to either recruit more FC(A) Sailors or increase SRB bonuses to make sure that sea billets are filled.

Another option is to remilitarize in-skill FC(A) billets that are now filled by civilians or contractors. This would give the Navy more in-skill billets for sea-shore rotation. The problem with this is that the Navy loses the savings gained from first civilianizing the billet. These savings were often substantial; competing functions save, on average, more than one-third of the original cost [2].

Determining which shore billets to add

In a 1998 paper on the cost of outsourcing in-skill shore billets [3], CNA found that Sailors who served in in-skill shore billets were more likely both to retain to 109 months and to advance to E-6 by 109 months. This was more true for "higher skill Sailors"—those who had longer training pipelines before going to the fleet. By that definition, FC(A) Sailors are some of the highest skill Sailors in the Navy.

In the 1998 study, CNA ran separate regressions for each rating. One regression covered the FC rating, including both Aegis-qualified and

non-Aegis-qualified Sailors. For the FC rating, CNA found the following about instructors and other in-skill billets:

- Instructors
  - Were 9.7 percentage points more likely to retain to 109 months
  - Were 20.9 percentage points more likely to advance to E-6 by 109 months
- Other in-skill billets
  - Retained at about the same rate as other billets
  - Were 11.9 percentage points more likely to advance to E-6.

Overall, advancement was heavily affected by the type of shore billet, and instructors were more likely to retain than those who served in other billets.

We will repeat the 1998 study for this FC(A) study, with some modifications. In order to make recommendations on how the Navy should manage FC(A) shore billets, we need to determine how FC(A) shore billets affect cost and readiness. The best way we have to do this is to determine the statistical effect of shore billets on FC(A) retention and promotion. The rest of this research memorandum documents that process.

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Data

Outcome variables

We selected two outcomes to measure—advancement to E-6 by 109 months and retention to 123 months—for several reasons:

- Good variation. In the sample, 55.8 percent of Sailors advance to E-6 by 109 months, and 59.3 percent retain to 123 months.
- Most Sailors had served a shore tour by 109 months.
- FC(A) Sailors have a 6-year initial obligation and then typically reenlist for 4 years, meaning that a large number of FC(A) Sailors leave the Navy at 120 months.

Criteria for the sample

Our sample consists of Sailors who fit the following criteria:

- Fire Controlmen (or FTC/FTM predecessor equivalents)
- Achieved a Navy Enlisted Classification (NEC) that makes them Aegis qualified before embarking on the first sea tour
- Served a shore tour after the initial sea tour
- Uninterrupted service
- Reached E-5 by 73 months
- Retained to 73 months
- Not Training and Administration of Reserves (TAR)
- Entered the Navy in fiscal years 1986–1996 (or 1986–1997 for promotion regressions). This was done both to give enough years for study and to start the study the first year that a supermajority of FC(A) Sailors entered the FC(A) community near

the beginning of their careers. Before 1986, many FC(A) Sailors received FC(A) training well into their careers, at a time at which they were likely to stay in the Navy until retirement. This was likely due to the rapid addition of Aegis ships to the Navy surface fleet. The last year used is 1996 because that is the last year in which all Sailors would have completed 10 years in the Navy, which is the length of the initial FC(A) obligation (6 years) plus the normal length of a second tour (4 years).

The sample has a total of 650 observations for the promotion regression and 602 observations for the retention regression.

Determining the type of shore job a Sailor has

Using the Navy's personnel records, we examined the careers of every FC(A) Sailor who entered the Navy between FY 1986 and FY 1997. We also took a close look at every FC(A) shore billet to organize them into different categories. To determine which type of shore tour a Sailor had, we followed these steps:

1. Take an inventory of all FC(A) shore billets.
2. Categorize each FC(A) shore billet using internal N12 and CNA knowledge. Billets were rated from 1, a billet that anyone in the Navy could fill, to 5, a billet intimately related to FC(A) work at sea (e.g., instructor work, shore-based maintenance of FC(A) systems). Billets rated 3, 4, or 5 were considered high-skill billets. As part of the FC(A) Action Group, N12 rated (with CNA's help) all of the billets residing in the FC(A) community. These billets were rated on a scale of 1 to 5, defined as follows:
   a. **1:** Billet that could be filled by any Sailor and is neither a leadership billet nor a billet that related to technology or the FC(A) community
   b. **2:** Leadership billet, such as instructor at Recruit Training Command (has nothing to do with FC community but builds leadership skills)
   c. **3:** Shore Intermediate Maintenance Activity or similar billet that requires technical skills but not an FC-related billet

d. **4:** FC-related, but not FC(A)-related, shore billet

e. **5:** Billet that uses specific skills used by the FC(A) community (usually maintenance or instructor billets).

3. Note the location of each billet—whether inside or outside the country—and note the type of billet using the Distribution Navy Enlisted Classification (DNEC). More specifically, we looked at the DNEC to see whether a billet was a recruiting or an instructor billet. Navy data do not allow researchers to match a specific enlisted billet to a specific enlisted body. In Navy data, enlisted Sailors are assigned to particular activities. Sailors also receive DNEC Codes if they fill billets that require an NEC. We defined an instructor as anyone who had an instructor DNEC (9502, 9504, 9505, 9508, 9509, and 9518).

4. Use personnel records of each Sailor to match them to the Unit Identification Codes (UICs) where they served and the time in which they served in those UICs. We used the UIC to determine the skill level of the UIC; in general, all billets within a UIC had the same skill rating.

5. Note when each Sailor received Recruit Training, FC (rating) training, and Aegis training.

6. Find the first non-TPPH shore tour after a sea tour following FC(A) training. This tour is used to assign Sailors to different groups used in our regressions. However, if the Sailor's relevant shore tour is a student tour and there was a non-TPPH shore tour directly afterward, we categorized based on the second shore tour and not the first. This was done because the student tour usually prepared the Sailor for the subsequent shore tour and should, therefore, be seen as part of that shore tour.

7. After determining the relevant shore tour to our study, we cross-matched the DNEC information with our billet rankings to separate the Sailors into several mutually exclusive groups, based on the types of shore tours they had:

   a. Instructor, high-skill

   b. Instructor, other

c. Other high-skill

d. Other OCONUS

e. Recruiter

f. Other CONUS (base for comparison).

Fortunately, in-skill billets (3/4/5) are concentrated in several Active Unit Identification Codes (AUICs), of which all the billets in these AUICs are in-skill billets and all other shore billets within the FC(A) community are out-of-skill billets. The specific AUICs were:

- 00178: NSWCD D
- 39029: Aegis Tech Rep (Morristown, NJ)
- 43888: Center for Surface Combat Systems (CSCS) Unit (Dam Neck, VA)
- 45534: SCSC (Wall Island)
- 45539: ATRC (Dahlgren, VA)
- 53996: TACTRAGRUPAC (San Diego, CA)
- 55236: SW RMC (San Diego, CA)
- 61762: NSWC DTWS (White Sands, NM).

The only problem with this method is that, if there were AUICs in the past that had FC(A) in-skill shore billets but do not now, then Sailors serving in these billets would be missed. However, this was the most accurate method at our disposal to determine high-skill shore billets.

Indicators of ability or skill

To identify the effect of different types of shore billets on retention and promotion, we need to separate out the effects of ability and skill on retention and promotion.

More-skilled Sailors will certainly promote faster than less-skilled Sailors [4, 5]. Also, Sailor skill may affect retention, increasing or decreasing retention depending on the rating (and model specification) [6]. Many retention models, such as the Annualized Cost of

Leaving (ACOL) model, don't explicitly include Sailor skill in the regression because they focus on comparing the income from staying in the Navy with that which the Sailor would likely receive by leaving [7]. In these regressions, demographic characteristics are used to determine this difference and, therefore, are not used independently to avoid multicollinearity.

Following the last CNA study on this topic, we used several variables as indicators of ability or skill:

- Top 10 percent in fiscal year to E-4
- Top 25 percent in fiscal year to E-4
- High school diploma graduate
- Armed Forces Qualification Test (AFQT) score dummies (under 70, 70–79, 80–89, over 90 (omitted)).

More specifically, we expect that those who reach E-4 more quickly will promote more quickly to E-6. We also expect those with a high school diploma and higher AFQT scores to promote more quickly.

We expect that Sailor skill will not have a large effect on retention.

Other control variables

Following the lead of [3], we used demographic and other control variables that might affect retention or promotion. The demographic variables include:

- Race (black, Hispanic, white (omitted))
- Age at accession (17–19, 20–22, 23–25, 26–30, 31+)
- Interaction of children or married at accession
- Became single while in Navy
- Married in Navy
- Had child while in Navy.

The results in [3] suggest that four characteristics increase retention:

- Black Sailors
- Older Sailors (24+ at accession)
- Being married at accession or getting married in the Navy
- Having a child in the Navy.

Similarly, that study found that these demographic characteristics increase promotion:

- Fast promotion to previous rates
- Higher AFQT score
- White
- Age 21–23 at accession
- Married at accession
- Getting married or becoming a parent while in the Navy.

The other variables include:

- Fiscal year of accession
- Length of initial sea tour.

Length of initial sea tour is important because it helps us observe attachment to the Navy that would otherwise be unobservable. Those who serve longer initial shore tours are likely to be those who enjoy serving at sea, and those Sailors should be more likely to retain and promote. Fiscal year dummies are included because promotion and retention rates vary by year.

Data summary

Tables 2 and 3 show summary statistics for all the variables in our study. Note that this sample is very different from the Navy enlisted population as a whole. The samples for the retention and promotion regressions are similar, but not the same because the promotion regressions have 1 more year of data. Here, we will expound on summary statistics for the retention regression, and the summary statistics are similar for the promotion regression.

Table 2. Summary statistics: Advance to E-6 by 109 months[a]

Variable	Mean	Min	Max
Promote to E-6 by 109 months	0.558 (0.497)	0	1
High-skill instructor	0.169 (0.375)	0	1
Other instructor	0.095 (0.294)	0	1
High-skill, noninstructor	0.275 (0.447)	0	1
OCONUS	0.020 (0.140)	0	1
Recruiter	0.114 (0.318)	0	1
Other CONUS	0.330 (0.469)	0	1
Black	0.088 (0.283)	0	1
Hispanic	0.085 (0.279)	0	1
Top 10% to E-4	0.063 (0.243)	0	1
11%-25% to E-4	0.126 (0.332)	0	1
No high school diploma	0.038 (0.192)	0	1
AFQT < 70	0.160 (0.367)	0	1
70 < AFQT < 79	0.245 (0.430)	0	1
80 < AFQT < 89	0.338 (0.474)	0	1
20 <= Age at accession <= 22	0.262 (0.440)	0	1
23 <= Age at accession <= 25	0.100 (0.300)	0	1
26 <= Age at accession <=30	0.048 (0.213)	0	1
Age 31+ at accession	0.015 (0.123)	0	1
Married w/child at accession	0.034 (0.181)	0	1

Table 2. Summary statistics: Advance to E-6 by 109 months[a] (continued)

Variable	Mean	Min	Max
Married w/o child at accession	0.048 (0.213)	0	1
Single w/child at accession	0.018 (0.135)	0	1
Became single in Navy	0.145 (0.352)	0	1
Got married in Navy	0.498 (0.500)	0	1
Became parent in Navy	0.552 (0.498)	0	1
FY87 accession	0.052 (0.223)	0	1
FY88 accession	0.032 (0.177)	0	1
FY89 accession	0.034 (0.181)	0	1
FY90 accession	0.065 (0.246)	0	1
FY91 accession	0.074 (0.262)	0	1
FY92 accession	0.065 (0.246)	0	1
FY93 accession	0.092 (0.290)	0	1
FY94 accession	0.066 (0.249)	0	1
FY95 accession	0.114 (0.318)	0	1
FY96 accession	0.149 (0.357)	0	1
FY97 accession	0.222 (0.416)	0	1
Length of first sea tour	44.946 (14.737)	2	100

a. Promote to 109 months—65- observations.

Table 3. Summary statistics: Retain to 123 months[a]

Variable	Mean	Min	Max
Retain to 123 months	0.593 (0.492)	0	1
High-skill instructor	0.181 (0.385)	0	1
Other instructor	0.093 (0.291)	0	1
High-skill, noninstructor	0.314 (0.464)	0	1
OCONUS	0.028 (0.166)	0	1
Recruiter	0.118 (0.323)	0	1
Other CONUS	0.266 (0.442)	0	1
Black	0.088 (0.284)	0	1
Hispanic	0.083 (0.276)	0	1
Top 10% to E-4	0.075 (0.263)	0	1
11%-25% to E-4	0.171 (0.377)	0	1
No high school diploma	0.040 (0.196)	0	1
AFQT < 70	0.178 (0.383)	0	1
70 < AFQT < 79	0.238 (0.426)	0	1
80 < AFQT < 89	0.324 (0.468)	0	1
20 <= Age at accession <= 22	0.277 (0.448)	0	1
23 <= Age at accession <= 25	0.105 (0.306)	0	1
26 <= Age at accession <=30	0.051 (0.221)	0	1
Age 31+ at accession	0.022 (0.145)	0	1

Table 3. Summary statistics: Retain to 123 months[a] (continued)

Variable	Mean	Min	Max
Married w/child at accession	0.033 (0.179)	0	1
Married w/o child at accession	0.066 (0.249)	0	1
Single w/child at accession	0.017 (0.128)	0	1
Became single in Navy	0.173 (0.378)	0	1
Got married in Navy	0.522 (0.500)	0	1
Became parent in Navy	0.621 (0.485)	0	1
FY87 accession	0.086 (0.281)	0	1
FY88 accession	0.048 (0.214)	0	1
FY89 accession	0.053 (0.225)	0	1
FY90 accession	0.096 (0.295)	0	1
FY91 accession	0.108 (0.311)	0	1
FY92 accession	0.081 (0.274))	0	1
FY93 accession	0.106 (0.308))	0	1
FY94 accession	0.071 (0.258)	0	1
FY95 accession	0.126 (0.332)	0	1
FY96 accession	0.176 (0.381)	0	1
Length of first sea tour	43.759 (15.304)	2	100

a. Retention to 123 months—602 observations.

First, since this is second term (Zone B) retention, the retention rate for Sailors in our sample is 59.3 percent. Therefore, larger deviations from this rate are to be expected because the base rate is higher.

Similarly, the promotion to E-6 by 109 months is high, but far from automatic at 55.8 percent.

Skill qualifications for entry into the FC(A) program are very high. As a result, there are very few Sailors without a high school diploma (4 percent). Also, FC(A) Sailors have very high AFQT scores—so high that it made sense to divide the AFQT categories as follows:

- AFQT under 70 (17.8 percent)
- 70<=AFQT<79 (23.8 percent)
- 80<=AFQT<89 (32.4 percent)
- AFQT over 89 (21.0 percent).

After using the foregoing criteria to group Sailors based on their shore billets, the following percentages of Sailors fall into each category:

- Instructor, high-skill (18.1 percent)
- Instructor, non-FC (9.3 percent)
- High-skill noninstructor (31.4 percent)
- OCONUS (2.8 percent)
- Recruiter (11.8 percent)
- Other CONUS (26.6 percent).

Disproportionally small percentages of our sample are black or Hispanic—8.8 percent black and 8.3 percent Hispanic.

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Estimation issues

Selection bias

As mentioned in [3], the most important empirical issue comes from the fact that assignment to high-skill shore jobs is not random. That means that we cannot be sure whether any correlation between different types of shore billets and retention and/or advancement is due to serving in those billets or the (unobservable) characteristics of the Sailor chosen to fill that billet. We attempt to control for Sailor abilities. If we don't fully control for the nonrandom part of the detailing process, however, selection bias may affect our estimates.

In contrast to other communities, average AFQT scores of Sailors in all categories of shore billets are about the same (in fact, the means are statistically indistinguishable). However, promotion to E-4 does vary among Sailors in different types of shore billets, as table 4 shows.

Table 4. Percentage of Sailors among top 25 percent to promote to E-4

Shore billet type	Percentage
High-skill instructor	20.9
High-skill noninstructor	25.7
Other instructor	12.9
Other CONUS	12.3
OCONUS	46.2
Recruiter	18.9

From the table above, we can see that Sailors who later serve in OCONUS shore billets are the quickest to E-4, followed by Sailors in high-skill billets (instructor and noninstructor) and recruiters. Least likely to promote quickly to E-4 are Sailors serving in other CONUS billets and other instructor billets.

Selection bias can also be on unobservable traits, including self-selection. It is possible that those who choose to serve in certain types of billets are those who most enjoy their Navy careers. Those Sailors will be much more likely to retain and probably more likely to promote than other Sailors.

The joint determination of retention and advancement

Another possible source of bias is that retention and advancement may be jointly determined. In other words, Sailors who are more likely to advance may be more likely to stay in the Navy because their prospects in the Navy are good. Some may be more likely to leave the Navy because their opportunities in the civilian job market are better than Sailors who are less likely to advance.

To address this issue, we attempted to use a bivariate probit model with selection, which allows the error terms in the retention and advancement equations to be correlated. This model was used in [3], an analysis about shore billets and retention and advancement, and in [4], which analyzed the effects of service and personal characteristics on advancement.

A bivariate probit model requires an identifying variable that affects retention but has no independent effect on the probability of advancement. The identifying variable we used was the average home state unemployment rate from 102 and 105 months. We did this because in the data there is a window between 105 and 123 months in which FC(A) Sailors leave the Navy. Unemployment should affect retention and not promotion because it is indicative of the civilian job opportunities that a person has around the decision time for the reenlistment.

Unfortunately, when we used the average home state unemployment rate for that time period, it was not correlated with retention. We tried other time periods after the first reenlistment point (78–81, 90–93, 102–105, 114–117) and for none of those time periods were average unemployment rate and retention correlated. Therefore, we used the probit regressions described previously and not the bivariate probit regressions for our results.

Statistical analysis

Methodology

As mentioned earlier, we use a probit model to estimate the effects of different types of shore billets on retention and advancement. A probit model has a dichotomous dependent variable and estimates the probability of an event occurring. We estimate the probit model and use the coefficients to estimate the marginal effects, which are the predicted changes in the probability of retention or advancement.

We hold constant every variable that we had available and that we believe could possibly affect retention and advancement and could be correlated with working in different types of shore billets. This is important because, in general, fast-trackers are more likely to be assigned to high-skill shore billets.

Results

How shore billet type affects continuation and advancement

Table 5 presents the results of the probit models for retention and advancement. These results are expressed as marginal values; the actual probit coefficients are in the appendix.

The important variables in table 5 are:

- High-skill / instructor billets
- Other instructor
- High-skill, noninstructor
- Recruiter
- Other, OCONUS.

Table 5. The effects of shore billets on retention and advancement (marginal values)[a]

Variable	Coefficient: Retention to 123 months (602 observations)	Coefficient: Promotion to E-6 by 109 months (650 observations)
High-skill instructor	0.122 (0.174)	**0.477** (0.169)
Other instructor	**0.687** (0.230)	**0.403** (0.208)
High-skill, noninstructor	0.100 (0.152)	0.137 (0.145)
OCONUS	**0.953** (0.394)	-0.479 (0.385)
Recruiter	**0.600** (0.209)	**0.358** (0.186)
Black	**0.612** (0.225)	-0.001 (0.198)
Hispanic	0.218 (0.207)	0.087 (0.202)
Top 10% to E-4	0.410 (0.237)	**0.477** (0.248)
11%-25% to E-4	0.054 (0.168)	**-0.114** (0.189)
No high school diploma	-0.370 (0.292)	0.227 (0.293)
AFQT < 70	0.110 (0.180)	-0.482 (0.180)
70 < AFQT < 79	-0.181 (0.162)	-0.387 (0.160)
80 < AFQT < 89	0.226 (0.152)	-0.149 (0.148)
20 <= Age at accession <= 22	**-0.231** (0.135)	0.086 (0.132)
23 <= Age at accession <= 25	**0.506** (0.216)	0.307 (0.201)
26 <= Age at accession <=30	0.321 (0.286)	0.142 (0.275)
Age 31+ at accession	0.005 (0.373)	0.420 (0.468)
Married w/child at accession	-0.076 (0.337)	-0.174 (0.320)
Married w/o child at accession	-0.206 (0.234)	-0.079 (0.266)

Table 5. The effects of shore billets on retention and advancement (marginal values)[a] (continued)

Variable	Coefficient: Retention to 123 months (602 observations)	Coefficient: Promotion to E-6 by 109 months (650 observations)
Single w/child at accession	-0.24 (0.492)	-0.492 (0.422)
Became single in Navy	-0.025 (0.171)	-0.059 (0.177)
Got married in Navy	-0.097 (0.122)	0.189 (0.115)
Became parent in Navy	**0.288** (0.119)	0.075 (0.113)
FY87 accession	**-0.916** (0.331)	-0.238 (0.390)
FY88 accession	-0.012 (0.366)	-0.686 (0.429)
FY89 accession	-0.364 (0.352)	**-1.047** (0.429)
FY90 accession	0.125 (0.324)	**-1.213** (0.378)
FY91 accession	-0.034 (0.317)	**-1.042** (0.377)
FY92 accession	-0.134 (0.340)	-0.432 (0.388)
FY93 accession	0.324 (0.334)	0.178 (0.388)
FY94 accession	0.006 (0.352)	-0.367 (0.394)
FY95 accession	0.206 (0.321)	-0.096 (0.368)
FY96 accession	-0.142 (0.318)	-0.343 (0.366)
FY97 accession		**-0.847** (0.004)
Length of first sea tour	**0.007** (0.004)	**0.014** (0.004)
Constant	-0.448 (0.367)	-0.102 (0.410)

a. Statistically significant coefficients (10-percent level) are in bold.

All of these variables are dichotomous variables that are mutually exclusive and are contrasted with other, CONUS shore billets, covering all shore billets in this study. Each variable is 1 if the relevant shore billet falls in that category, and 0 otherwise.

In the promotion regression (promotion to E-6 by 109 months), we compared different shore tours with non-FC, noninstructor, and non-recruiter CONUS shore tours and found the following:

- High-skill instructors were 17.8 percentage points more likely to promote
- Other instructors were 15.1 percentage points more likely to promote
- Recruiters were 13.5 percentage points more likely to promote
- Sailors in OCONUS billets and other high-skill billets were neither more nor less likely to promote.

In the retention regressions (retention to 123 months), we found:

- Non-FC instructors were 23.1 percentage points more likely to retain.
- Recruiters were 20.8 percentage points more likely to retain.
- Those in OCONUS billets were 28.8 percentage points more likely to retain.
- Those in high-skill billets (instructor and noninstructor) were no more likely to retain than those in other CONUS shore billets.

Other variables

In the promotion regressions, we found that these other variables increase the probability of promotion to 109 months:

- Being the top 10 percent in your year to advance to E-4
- Higher AFQT score
- Longer first sea tour.

All other variables were statistically significant.

In the retention regressions, these variables increased the chance of retaining to 123 months:

- Black
- Top 10 percent to E-4
- Age 23–25 at accession (compared with age 17–19, age 20–22 at accession had lower retention)
- Became a parent while in Navy
- Length of first sea tour.

Summary of findings

Promotion regressions

The results of the promotion regression suggest that instructors and recruiters have higher promotion rates than FC(A) Sailors serving in other types of billets. Reference [3] found similar results throughout the Navy; however, [3] also found that Sailors serving in high-skill billets also had higher promotion rates, which we did not find in this study. Our study has relatively low power, so any effect that was smaller than 10 percentage points would not be considered statistically significant. Sailors serving in high-skill billets could be more likely to promote, but by smaller amounts than 10 percentage points. Reference [3] found that the promotion effect for high-skill noninstructors was much smaller than that for instructors.

Most of the other results are similar to the results of [3]. Higher AFQT scores increase the probability of advancement. The only major change from [3] is that more sea time is correlated with lower promotion rates in [3], whereas more sea time increases promotion probability in our regression.

Retention regressions

In [3], CNA found that both instructors and Sailors in other high-skill billets were more likely to retain than Sailors serving in nonrecruiter

CONUS billets. Reference [3] also found that recruiters and those serving in OCONUS billets were more likely to retain.

The effect of demographic and other variables on retention is as expected. Black Sailors are more likely to retain, possibly because of worse outside employment opportunities ([3] found this as well). Longer sea tours suggest higher retention.

Again, due to the number of observations, small but real effects, such as 6 to 7 points, would be statistically insignificant. The retention effects we found in our study were sensitive to sample inclusion. We excluded all Sailors who did not complete 73 months of service because we wanted Sailors who had completed their 6-year Initial Service Obligation. Sailors who had begun shore tours after sea tours, but left before 73 months, were almost uniformly stashed in other CONUS billets, probably anticipating their exit from the Navy. Including these Sailors in the sample would have made it appear that serving in other CONUS billets resulted in lower retention than it actually does.

On one hand, it's plausible that placing Sailors in high-skill FC-related billets increases their career prospects both inside and outside the Navy, making retention prospects unclear. On the other hand, there is likely self-selection; those who most want to remain in the Navy choose to serve in such billets as recruiting, boot camp, and OCONUS billets. These are relatively small groups (20 to 25 percent of the sample), so selection is possible.

Implications for FC(A) community management

In what types of shore billets should FC(A) Sailors serve?

We can summarize the results in the last section by noting:

- Out-of-skill, nonrecruiter billets are not good for FC(A) retention and promotion.
- Recruiter billets and non-FC instructor billets correlate with higher FC(A) retention and promotion.
- High-skill instructor billets correlate with higher promotion but not higher retention.
- High-skill noninstructor billets are not associated with higher retention or promotion.

This suggests that the effect of FC(A) shore billets on retention is unclear and may come from self-selection into certain types of billets.

Recommendations

We recommend that the Navy use a mixed strategy to manage its FC(A) community:

- Continue to aggressively pursue sea duty incentives, such as Sea Duty Incentive Pay.
- Remilitarize instructor shore billets as needed if sea duty incentives fail in achieving the needed sea/shore balance.
- Also, the Navy should allow willing FC(A) Sailors to serve in recruiter, OCONUS, or non-FC instructor billets.

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Appendix: Probit estimates (actual coefficients)

Table 6 shows the actual probit coefficients on our regressions relating the effects of shore billets on retention and advancement. Both regressions are the same ones whose results are shown in table 5.

Table 6. The effects of shore billets on retention and advancement (actual coefficients)[a]

	Coefficient	
Variable	Retention to 123 months (602 observations)	Promotion to E-6 by 109 months (650 observations)
High-skill instructor	0.046	**0.178**
	(0.065)	(0.059)
Other instructor	**0.232**	**0.151**
	(0.064)	(0.072)
High-skill, noninstructor	0.038	0.054
	(0.058)	(0.056)
OCONUS	**0.288**	-0.189
	(0.079)	(0.147)
Recruiter	**0.208**	**0.135**
	(0.063)	(0.067)
Black	**0.210**	0.000
	(0.065)	(0.078)
Hispanic	0.081	0.034
	(0.074)	(0.078)
Top 10% to E-4	0.147	**0.175**
	(0.078)	(0.082)
11%-25% to E-4	0.021	-0.045
	(0.064)	(0.075)
No high school diploma	-0.146	0.087
	(0.116)	(0.108)
AFQT < 70	0.042	**-0.191**
	((0.068)	(0.070)
70 < AFQT < 79	-0.070	**-0.153**
	(0.064)	(0.063)

Table 6. The effects of shore billets on retention and advancement (actual coefficients)[a] (continued)

Variable	Coefficient: Retention to 123 months (602 observations)	Coefficient: Promotion to E-6 by 109 months (650 observations)
80 < AFQT < 89	0.086 (0.057)	-0.059 (0.058)
20 <= Age at accession <= 22	**-0.090** (0.053)	0.034 (0.051)
23 <= Age at accession <= 25	**0.179** (0.068)	0.117 (0.073)
26 <= Age at accession <=30	0.117 (0.097)	0.055 (0.104)
Age 31+ at accession	0.002 (0.143)	0.155 (0.157)
Married w/child at accession	-0.029 (0.132)	-0.069 (0.127)
Married w/o child at accession	-0.081 (0.093)	-0.031 (0.105)
Single w/child at accession	-0.094 (0.196)	-0.194 (0.161)
Became single in Navy	-0.009 (0.066)	-0.023 (0.070)
Got married in Navy	-0.037 (0.047)	0.074 (0.045)
Became parent in Navy	**0.111** (0.046)	0.029 (0.045)
FY87 accession	**-0.351** (0.114)	-0.095 (0.155)
FY88 accession	-0.005 (0.141)	-0.266 (0.153)
FY89 accession	-0.143 (0.140)	**-0.382** (0.123)
FY90 accession	0.047 (0.121)	**-0.432** (0.099)
FY91 accession	-0.013 (0.123)	**-0.385** (0.113)
FY92 accession	-0.052 (0.134)	-0.171 (0.151)
FY93 accession	0.119 (0.115)	0.069 (0.147)
FY94 accession	0.002 (0.135)	-0.146 (0.155)

Table 6. The effects of shore billets on retention and advancement (actual coefficients)[a] (continued)

Variable	Coefficient: Retention to 123 months (602 observations)	Coefficient: Promotion to E-6 by 109 months (650 observations)
FY95 accession	0.077	-0.038
	(0.117)	(0.146)
FY96 accession	-0.055	-0.136
	(0.124)	(0.145)
FY97 accession		**-0.327**
		(0.127)
Length of first sea tour	**0.003**	**0.005**
	(0.002)	(0.002)

a. Statistically significant coefficients (10-percent level) are in bold.

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List of tables

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