

Are Aviation Obligations Driving Students Away?

Carol S. Moore

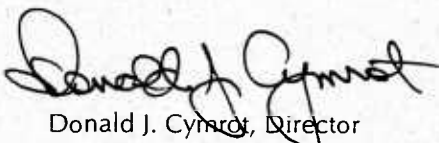
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A handwritten signature in black ink, appearing to read "Donald J. Cymrot". The signature is stylized with a large, looped initial "D" and a cursive "Cymrot".

Donald J. Cymrot, Director
Workforce, Education and Training Team
Resource Analysis Division

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Are Aviation Obligations Driving Students Away?

Dr. Carol Moore
Center for Naval Analyses

Evidence suggests that the quality of aviation accessions has been falling. Decision-makers question whether the decline is the result of the active duty service obligations (ADSOs) required of aviators. In a way, these lengthy obligations compensate for the expense of training new aviators to replace those who depart. Traditionally, the aviation community has been able to attract the most promising students, turning away many each year. Is the growing difference between aviation ADSOs and those required in other communities leading the best students to forgo aviation? N13 asked CNA to analyze this issue.

Background

- Aviator ADSOs longest in URL
 - After flight school: Jet 8, prop/helo 7, NFO 6
 - Uncertainty
 - SWO, Nuke and others: up to 5 years after commission
- Last increase applies to YG91 and later
 - USNA grads after 1/1/92
 - NDAA FY90-91 (1989)

Aviation ADSOs are the longest in the Unrestricted Line (URL). They range from 6 to 8 years upon designation as a naval aviator—that is, at completion of flight school or undergraduate training. Aviators who complete jet training are obligated for 8 years. Pilots who complete training on any other type of aircraft are obligated for 7 years; for naval flight officers (NFOs), the service obligation is 6 years.

Obligations in the other URL communities range from 3 to 5 years after the date of commission, depending on the source (Naval Academy, NROTC, or Officer Candidate School).

Most ADSOs have remained fixed over the years, but aviation obligations have increased. Before the late 1980s, all pilots and NFOs were obligated for 5 years after flight school, and most were eligible to leave after completing 6 years of service. Starting in FY88, newly commissioned aviators faced obligations of 6 or 7 years. The current obligations were established with the National Defense Authorization Act of Fiscal Years 90 and 91 (NDAA 90-91). The new law applied to Naval Academy graduates starting with year group 92, and other personnel starting with year group 91.*

*The obligations enacted in NDAA 90-91 apply to personnel who graduated from the service academies after January 1, 1992, and to others who started undergraduate flight training after September 30, 1990. Source: Department of Defense, *Military Compensation Background Papers*, November 1991.

Today's Decision Process?

Indicate the community
you prefer

When will you be eligible to leave
the Navy?

☐

Pilot

in 9 or 10 years +

☐

NFO

in 8 years +

☒

Surface
Warfare

in 3 to 5 years

When can aviators expect to be eligible to leave the Navy, and how does it compare to what other officers can expect? Is the difference affecting choices?

The clock on aviation ADSOs starts *after* flight school (the clock is ticking during "graduate training" in a Fleet Replacement Squadron). Ideally, flight school ranges from 1.5 to 2 years. However, time to train has increased in recent years; jet pilots, for example, can take 3 years to complete flight school. Students have practically no control over the duration of training, so obligations are not only long but also uncertain. Therefore, aviators can expect to spend between 8 and 10 years in the Navy (maybe more). The typical jet pilot who is commissioned at the age of 22 would be at least 32 years old before he or she is allowed to leave the Navy.

In contrast, a Surface Warfare Officer who is commissioned at age 22 will be eligible to leave in 3 to 5 years, between the ages of 25 and 27.

Three Questions

- How can we interpret evidence that the quality of student aviators is falling?
- Is quality falling because talented officers are choosing communities with shorter obligations?
- If not, what else might be driving the observed decline in quality?

Our analysis focused on three questions.

First, what evidence is there that the quality of student aviators is falling, and how do we interpret it? Do objective quality measures point to a problem with the ADSO?

We focus on the quality of new students, rather than on quantity, because aviation has continued to attract sufficient *numbers* of interested students.

The second task is to see if there is a relationship between the obligation and the quality of students selecting aviation.

Finally, if quality is declining and obligations do not seem to be the cause, what is?

Evidence Points to Decline in Quality, But Doesn't Say Why

- Indicators include
 - Lower ASTB scores
 - Training attrition increasing
 - Perception of worsening student attitudes
- Role of ASDO not clear
 - ASTB decline not confined to aviators—suggests other reason for decline in scores
 - Attrition may be the result of changed standards, etc.

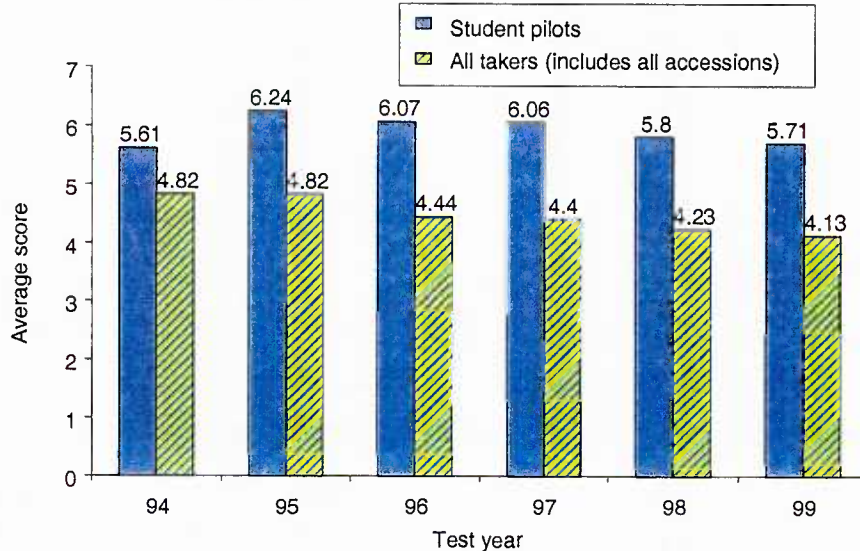
Evidence that the quality of student aviators has declined includes the following. Recent cohorts have had lower average scores on the Aviation Selection Test Battery (ASTB), a basic aptitude test taken by all prospective officers. In addition, Naval Aviation Schools Command (NASC) data indicate that training attrition is higher now than it has been in the recent past.

The concerns about the ASDO have come from looking at test results of aviators only. Including the scores of everyone who takes the test leads to another interpretation. Scores on the ASTB have been falling for everyone—including those who eventually join the Surface, Nuke, and other URL communities. Declining pilot and NFO scores may be part of a broader trend in test scores.

Increased training attrition does not, by itself, prove that student quality has declined. Perhaps standards have changed. Furthermore, data on attrition from flight school provide no evidence for a shift in the quality of aviators relative to other officers.

Decline in Scores Not Limited to Aviators

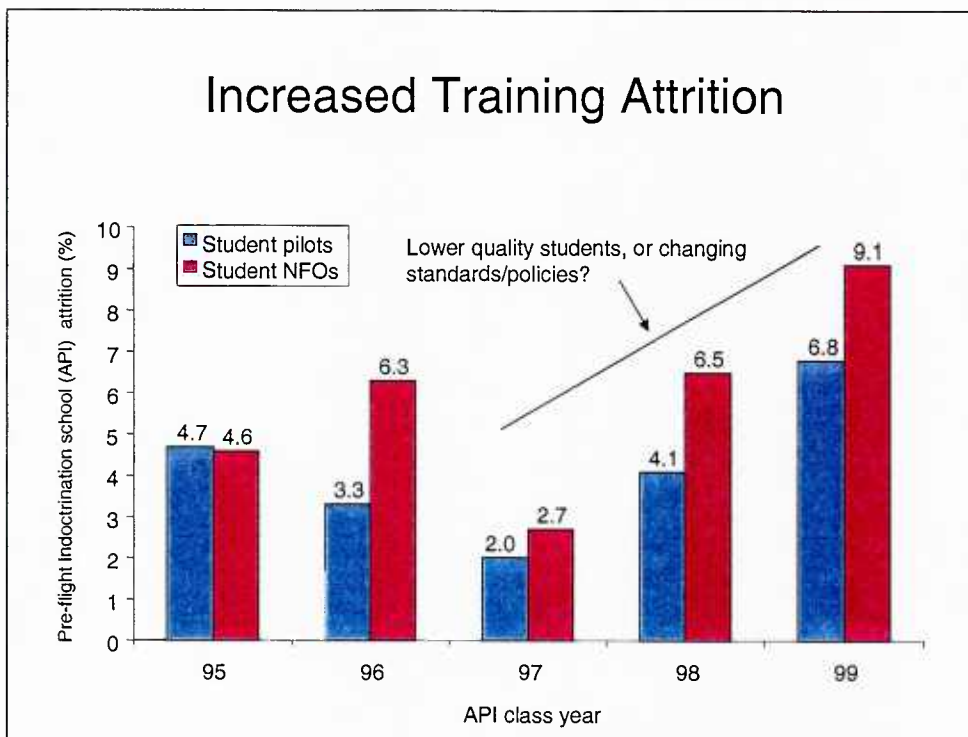
Pilot Flight Aptitude Rating Averages



This chart shows that the decline in test scores is not limited to aviators. All takers show declines. The Pilot Flight Aptitude Rating (PFAR) is one of five components of the ASTB. Average scores have declined on all components.

If the longer ADSO were driving differences in aviation accession quality, we would expect to see a decline in the PFAR scores of pilots, but either no change or an increase in the scores of officers (with pilot averages remaining above those of others).

Increased Training Attrition



This chart shows that attrition of student pilots and NFOs has increased since FY97, and is now the highest it has been since FY95. The segment of the training pipeline shown here is Aviation Pre-flight Indoctrination school (API).

API is the first step in the training process. No one can predict the total attrition rate of the FY99 cohort until it reaches the end of the undergraduate training pipeline. The increase in API attrition may reflect a shift in the *timing* of attrition from later to earlier stages of training. It is also possible that standards or attrition policies have changed.

ADSO and Choice of Community: Approach

- Focus on USNA grads
 - Can estimate relative quality of student fairly reliably
 - Top students have more choice
 - Future leadership potential
- Examine relationship between class standing and community
 - See if patterns suggest a problem with ADSO
- Focus on pilots

To discern a relationship between accession quality and ADSO, one must first measure the *relative* quality of each member of a cohort. Our approach was to focus on Naval Academy (USNA) graduates. In general, the lineal numbers of USNA graduates are assigned in order of class standing. By ranking lineal numbers within a year group, we can estimate the relative quality of each student in the class. Such consistent relative quality measures are not available to rank accessions from NROTC and Aviation Officer Candidate School (AOCS).

Furthermore, midshipmen with higher class standing get more choice of community. Subject to physical qualifications and other criteria, they are first in line to choose on Service Assignment Night. Although the assignment process has changed in recent years, the relationship between class standing and range of choice still exists.

With historical data on lineal numbers and designators, we can ask if the top students are less likely to start their careers in aviation now than they were in the past. Given the choice, do they opt for other communities? Next, we see if patterns in the quality distribution suggest that the ADSO is discouraging top students from entering aviation.

There are several other reasons to focus on USNA graduates. Overall, this is a particularly high-quality, motivated group; in general, Naval Academy graduates are more likely to rise to senior levels than other officers. It would be particularly troublesome if they showed signs of balking at aviation's obligations.

We focused on pilots rather than NFOs because pilot obligations have increased more. If the ADSO is no problem for pilots, it is unlikely to be a problem elsewhere in aviation.

Measuring Class Standing

- Lineal number (LN) at start of service
 - For USNA grads, correlates with grades as recorded in Academic Profile Code
 - Lower LN means higher class standing
- Divided each class (year group) into quartiles based on LN
 - Top, second, third, and bottom
- Most recent cohort is YG97
 - LN not recorded until second year of service

To verify that the lineal number reflects class standing, we checked it against data on grades as recorded in the Academic Profile Code of the Officer Master Files. There was a strong (albeit imperfect) correlation between grades and the lineal number. We discuss our handling of the lineal number data, as well as our dataset selection criteria, in a backup slide.

We created four quality categories by dividing each class, or year group, into quartiles. The top 25 percent of the class is the highest quality category, and the bottom 25 percent is the lowest.

Our dataset covered year groups 85 through 97. We were not able to include FY98 and FY99 accessions. The lineal number is not recorded in the Officer Master Files until the second year of service, even though it was created well before then. Despite this recording lag, it is unlikely that a student's lineal number would change between the time of graduation and the second year of service.

Many officers switch communities during their first several years of service. We confined our attention to officers' *first* designators.

Is USNA Student Pilot Quality Falling?

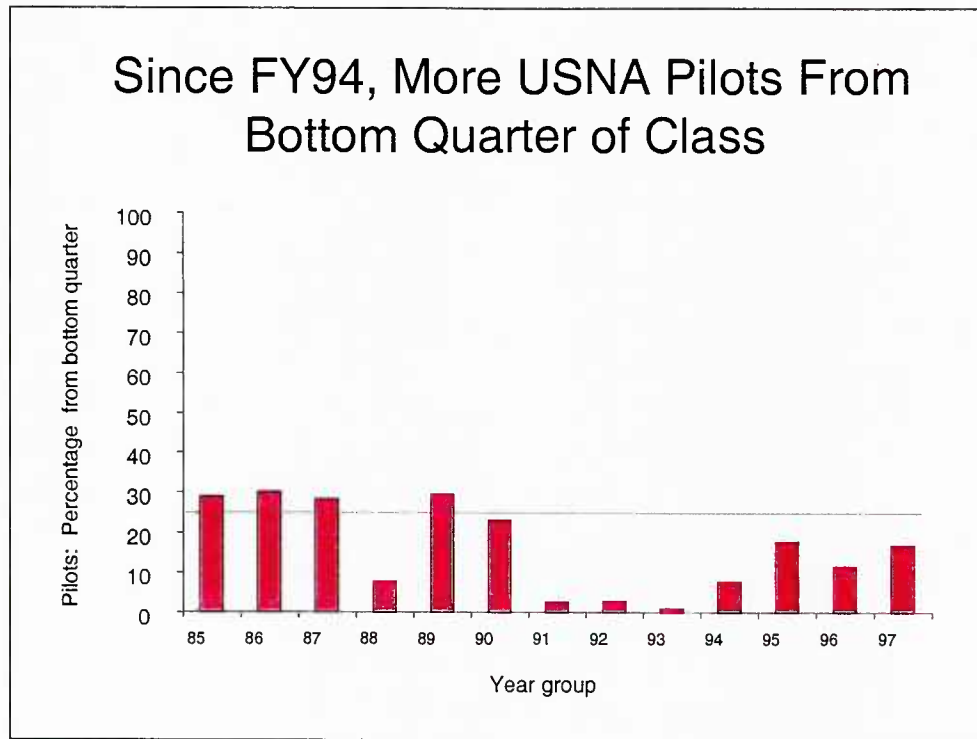
- No...
 - Since late 1980s, more are drawn from the *top half of the class*
 - Recent increase in fraction from *top 25 percent*
 - Aviation now attracting a greater share of graduates than in the past—*especially top graduates*
- ...But,
 - Increase in fraction from the *bottom 25 percent* since drawdown

Are good Naval Academy students showing a decreased willingness to enter the pilot community? Several indicators say “no.”

The fraction of new student pilots that comes from the top 50 percent of the class is consistently higher in the 1990s than in the 1980s, even though the obligation is longer. The fraction from the top 25 percent grew between FY95 and FY97.

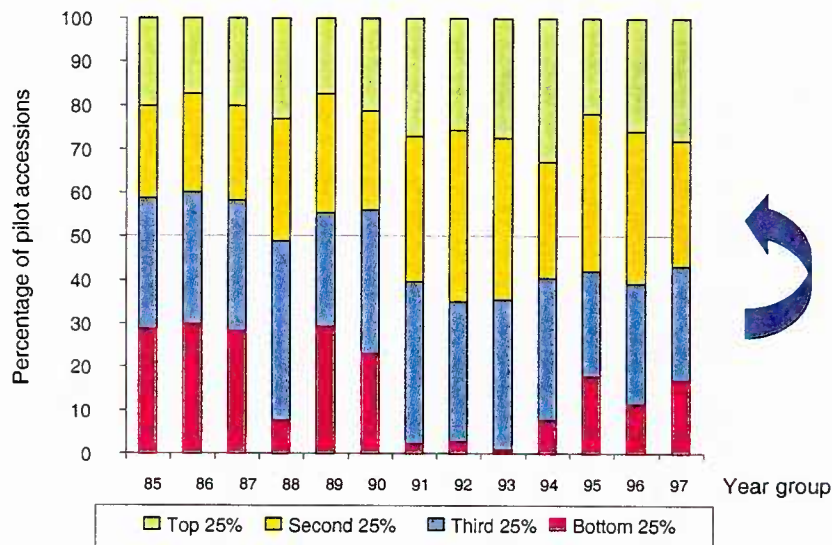
Most important, Naval Academy graduates are more likely to enter aviation now than ever before, and this growth has been concentrated among the top students. If ADSO were a problem, we would expect the growth to be concentrated among the lower-ranked students.

However, the news is not all good. An increasing fraction of USNA pilot accessions come from the bottom quarter of their classes, and this has affected the overall quality mix.



This chart shows the increase in the fraction of USNA accessions that come from the bottom 25 percent of the class. In FY93, only 0.9 percent came from the bottom 25 percent; in FY97, the figure had increased to 17 percent. The annual average for FY85-89 was 24.6 percent. Note that the current trend represents a reversion to the rates of the 1980s. When requirements decrease, as in the mid-1990s, the Navy employs more rigid criteria in admitting people into the community.

Fewer USNA Pilot Accessions From Bottom Half



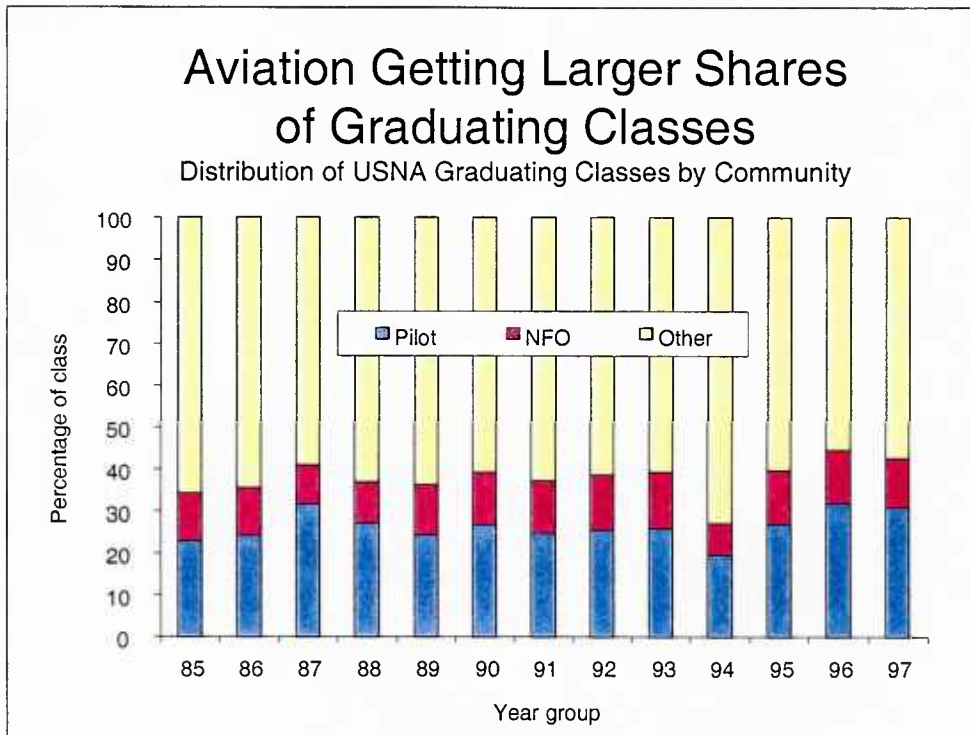
This chart overlays the rest of the quality distribution on top of the bottom 25 percent. It gives a mixed picture of the quality trend, and of the role of the ADSO. The fraction in the top 50 percent has grown from an average of 43.7 percent in the late 1980s to an average of 60.6 percent in the 1990s, despite the increase in the ADSO over the period.

It may be argued, however, that what is relevant is the quality distribution *since* the drawdown and that year groups 92 through 94 should not be included in the comparison. It is possible that the effect of the ADSO would not be felt during those years because requirements were so low. In fact, there are some indications of declining quality since the end of the drawdown. For instance, 65 percent of USNA grads in year group 93 were from the top 50 percent. In year group 97, this number was only 57 percent. The change seems driven by the increase in the share from the bottom quartile of the class.

Nevertheless, the fraction from the top 50 percent continues to be higher among the cohorts of the 1990s than among those from the 1980s.

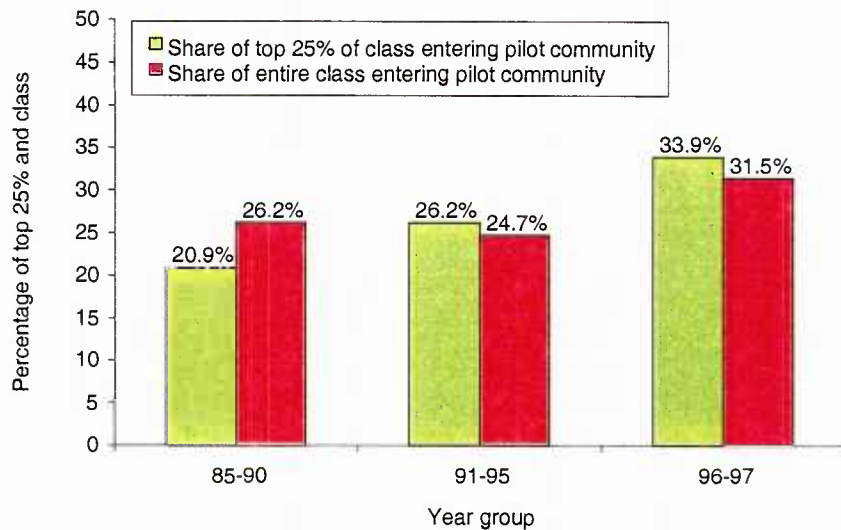
More positive news comes from tracking the share of pilot accessions from the top 25 percent of the class. This figure peaked with year group 94, then declined drastically the next year as demand bounced back. Since then, however, it has grown from 22 percent in FY95 to 28 percent in FY97.

Detailed data for the pilot, NFO, Surface, and Submarine communities appear on backup slides. The submarine community has seen the greatest reduction in the representation of top students.



Aviation is getting an increasing share of each graduating class. On average, 37 percent of year groups 85 through 91 entered the pilot and NFO communities. For year groups 95 through 97, the figure was 42 percent. The change is partly driven by comparative cuts in submarine requirements. The pilot community, especially, has grown since the drawdown—from only 19 percent of accessions in FY94 to 31 percent in FY97.

Growth in USNA Pilot Accessions Disproportionately From Top 25%



If the ADSO were driving away high-quality students, we would expect the growth in pilot accessions to be concentrated among medium and lower quality students. The top students, given the choice, would enter another URL community, while the lower-ranked students would wind up in aviation.

Instead, this growth is concentrated among the best students. We compared the communities of the top 25 percent of each class with the overall community distribution within each class. The top 25 percent of the class is now *more* likely to become pilots than in the past. This trend is unambiguously upward—a backup slide shows the data in detail. Furthermore, the growth in the top 25 percent has been much faster than overall growth since the 1980s—13 percentage points, compared to 5 percentage points overall.

These data differ from those we have previously shown, which looked at the quartile distribution within each pilot year group. The approach here is slightly different: we examine each quartile and ask, “How many of the top 25 percent entered aviation, and how many entered other communities?”

What is Causing Reduced Performance?

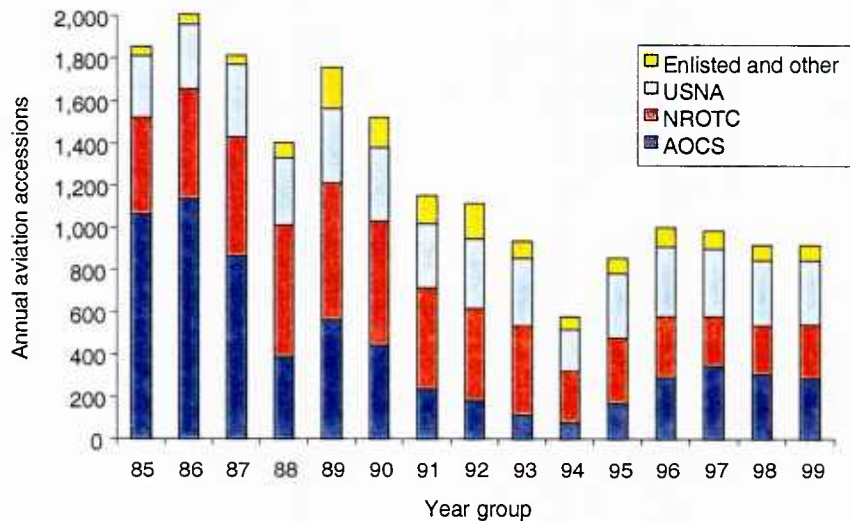
- Expanded requirements—dig deeper into the quality pool to fulfill accession goals
 - More low scorers
 - More AOCS
- Independent decline in ASTB scores
 - Cause unclear
 - Possibility: USNA selectivity may be down

Our data do not provide evidence that the top students are now avoiding aviation in favor of other communities; there is little to suggest that the ADSO is driving students away. If anything, the relative quality of pilot accessions from the Naval Academy has increased since the 1980s, before the lengthening of obligations.

What, then, lies behind the changes in attrition and test scores? We contend that expanded requirements play a role. Aviation accession requirements fell dramatically during the drawdown, and the community could afford to turn away all but the most promising students. A decline in average quality is a natural consequence of higher requirements. The Naval Academy graduates about the same number of officers each year. To bring enough people into aviation, the community may need to dig deeper into the quality pool. It will have to take more low scorers from the Naval Academy, and turn on the AOCS “valve.” Generally, AOCS accessions are thought to be of slightly lower quality than Naval Academy accessions into aviation.

Second, the decline in scores appears to be independent of any changes in the aviation community. The cause is not clear, but it may have to do with the recent decline in the numbers of high school students who apply to the Naval Academy.

Accessions Recovering From Drawdown



This slide shows that accessions, which were at their lowest points in FY94 and FY95, are recovering. The biggest change is from AOCS accessions. A backup slide shows Naval Academy accessions into the pilot, NFO, and other communities. An additional backup slide details the percentage of aviation accessions from each source.

Conclusions

- Data support perception that student aviator quality has declined
- Most likely explanation: increased accession requirements
- Aviation continues to attract top students despite ADSO
- Possible that more recent data (year groups after 97) will tell a different story

After reviewing several sources of data, we drew the following conclusions. First, there is evidence that the quality of student pilots and NFOs has declined. More than merely an impression, the perception of lower quality is borne out by test score data. Expanded accession requirements, and the need to dig deeper into the quality pool to meet them, play roles. It is also possible that Naval Academy selectivity declined during the drawdown, and that the effect on overall student quality is being felt now.

We also found that aviation continues to attract top Naval Academy students despite the ADSO. We find no evidence that the best are opting increasingly for Surface Warfare or otherwise placing great weight on the ADSO. Student choice is one factor determining who enters which community. Naval Academy students have more choice of community than do other accessions, and the top midshipmen have the most choice of all.

There are several limitations to our analysis. We were not able to obtain data on the lineal numbers of year groups beyond 97. However, it is likely that if the ADSO were driving away top students, we would see it in FY96 and FY97, when requirements were rebounding. Second, we are unable to observe student preferences directly: ideally, we would ask prospective officers to rank their choice of community, and have them explain their answers. Our approach of examining correlations between class standing and community, while credible and suitable for this short study, provides only a glimpse of changes in student preferences.

Backup Information

Dataset selection criteria

- Excluded individuals with lineal number assigned earlier or later than rest of YG
 - Mostly non-URL, possibly some enlisted time
- Included individuals *even if* APC and LN gave different indications of class rank
 - APC driven by overall, math, and tech grades
 - Other qualities may factor into class rank

We used the Officer Master File to develop our database of USNA graduates. As we indicated earlier, officers' lineal numbers at the date of commissioning generally showed up in the data two years later. We excluded individuals with lineal numbers that were recorded substantially earlier or later than other members of their year group. For instance, 97 percent of year group 90 lineal numbers appeared in the data for FY92. Three percent of the lineal numbers were recorded in other years; we excluded these cases.

To validate our approach, we correlated lineal numbers with the Academic Profile Code (APC), a field in the Officer Master File indicating grades in all subjects and in science/math. We included in our analysis cases that seemed to be outliers in the overall correlation between the APC and the lineal number because of the likelihood that nonacademic qualities figure into the lineal number.

The next four slides show the quartile distribution within the pilot, NFO, Surface, and Submarine communities between FY85 and FY97. The first data column shows the number of observations in our dataset. Because we excluded a few cases, this is slightly less than or equal to the number of actual accessions indicated in our data.

USNA Pilots (139X)

<u>YG</u>	<u>Count</u>	<u>Percent in Top Quartile</u>	<u>Percent in Second Quartile</u>	<u>Percent in Third Quartile</u>	<u>Percent in Bottom Quartile</u>	<u>Total</u>
85	194	20.1	21.1	29.9	28.9	100
86	196	17.3	22.4	30.1	30.1	100
87	264	20.1	21.6	29.9	28.4	100
88	234	23.1	27.8	41.5	7.7	100
89	238	17.2	27.3	26.1	29.4	100
90	234	21.4	22.6	32.9	23.1	100
91	204	27.0	33.3	37.3	2.5	100
92	219	25.6	39.3	32.4	2.7	100
93	211	27.5	37.0	34.6	0.9	100
94	143	32.9	26.6	32.9	7.7	100
95	206	21.8	35.9	24.3	18.0	100
96	224	25.9	34.8	27.7	11.6	100
97	235	28.1	28.5	26.4	17.0	100

Count = number of accessions included in our data.
It is slightly smaller than actual accessions.

USNA NFOs (137X)

<u>YG</u>	<u>Count</u>	<u>Percent in Top Quartile</u>	<u>Percent in Second Quartile</u>	<u>Percent in Third Quartile</u>	<u>Percent in Bottom Quartile</u>	<u>Total</u>
85	94	34.0	40.4	23.4	2.1	100
86	90	25.6	38.9	32.2	3.3	100
87	78	25.6	38.5	32.1	3.8	100
88	82	34.1	42.7	18.3	4.9	100
89	115	17.4	32.2	33.9	16.5	100
90	109	33.9	35.8	23.9	6.4	100
91	101	25.7	31.7	37.6	5.0	100
92	109	23.9	30.3	41.3	4.6	100
93	108	25.9	24.1	32.4	17.6	100
94	55	30.9	50.9	14.5	3.6	100
95	96	27.1	34.4	20.8	17.7	100
96	90	35.6	21.1	36.7	6.7	100
97	88	23.9	33.0	23.9	19.3	100

Count = number of accessions included in our data.
It is slightly smaller than actual accessions.

USNA SWOs (116X)

<u>YG</u>	<u>Count</u>	<u>Percent in Top Quartile</u>	<u>Percent in Second Quartile</u>	<u>Percent in Third Quartile</u>	<u>Percent in Bottom Quartile</u>	<u>Total</u>
85	296	13.5	15.5	28.0	42.9	100
86	273	20.5	16.1	25.6	37.7	100
87	268	17.5	20.1	26.1	36.2	100
88	301	11.3	15.3	21.9	51.5	100
89	294	14.6	16.7	30.6	38.1	100
90	276	12.3	19.2	27.9	40.6	100
91	299	12.7	12.4	19.7	55.2	100
92	299	14.4	13.7	21.1	50.8	100
93	276	10.5	13.0	20.3	56.2	100
94	363	10.5	19.0	29.5	41.0	100
95	281	16.7	16.4	29.2	37.7	100
96	260	16.2	15.0	23.1	45.8	100
97	258	17.1	17.8	22.1	43.0	100

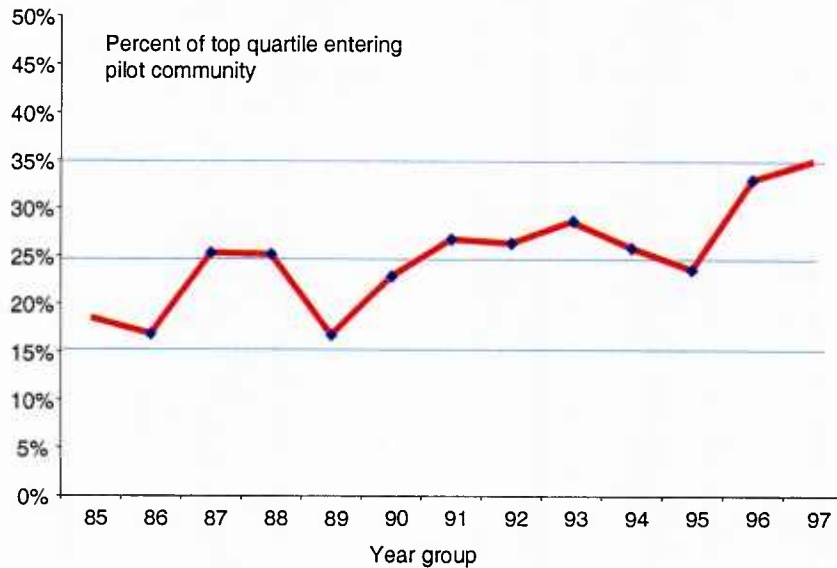
Count = number of accessions included in our data.
It is slightly smaller than actual accessions.

USNA Submariners (117X)

<u>YG</u>	<u>Count</u>	<u>Percent in Top Quartile</u>	<u>Percent in Second Quartile</u>	<u>Percent in Third Quartile</u>	<u>Percent in Bottom Quartile</u>	<u>Total</u>
85	161	48.4	38.5	12.4	0.6	100
86	138	47.1	39.9	12.3	0.7	100
87	135	51.1	36.3	9.6	3.0	100
88	121	59.5	32.2	8.3	0.0	100
89	187	52.9	36.9	7.5	2.7	100
90	136	54.4	32.4	10.3	2.9	100
91	101	50.5	44.6	4.0	1.0	100
92	80	51.3	33.8	11.3	3.8	100
93	97	61.9	25.8	12.4	0.0	100
94	90	62.2	30.0	7.8	0.0	100
95	88	56.8	29.5	10.2	3.4	100
96	68	44.1	42.6	11.8	1.5	100
97	106	40.6	29.2	27.4	2.8	100

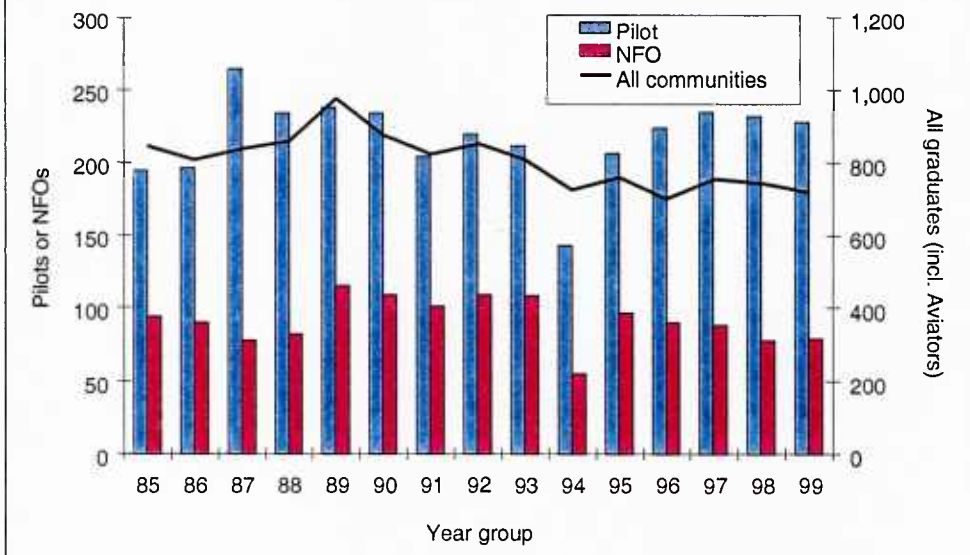
Count = number of accessions included in our data.
It is slightly smaller than actual accessions.

Top 25% of USNA Class: Share Becoming Pilots Has Increased

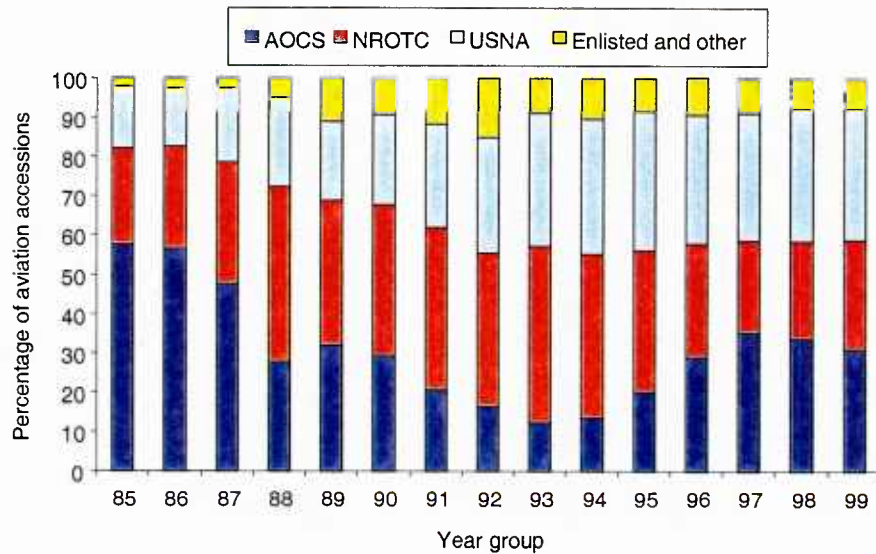


Among the top quartile of each class, an increasing percentage enter the pilot community. In FY85, only about 19 percent of the top quartile became student pilots; in FY97, the figure was 35 percent.

USNA Aviation Accessions Stabilizing After Drawdown



AOCS Accessions Reflect Expanded Aviation Requirements



This slide focuses on the composition of aviation accessions in more detail. During the height of the drawdown in FY94, only 13.2 percent of aviation accessions came from AOCS, and 34.5 percent came from the Naval Academy. In FY99, 31.3 percent came from AOCS, and the fraction from the Naval Academy declined slightly to 33.2 percent.

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