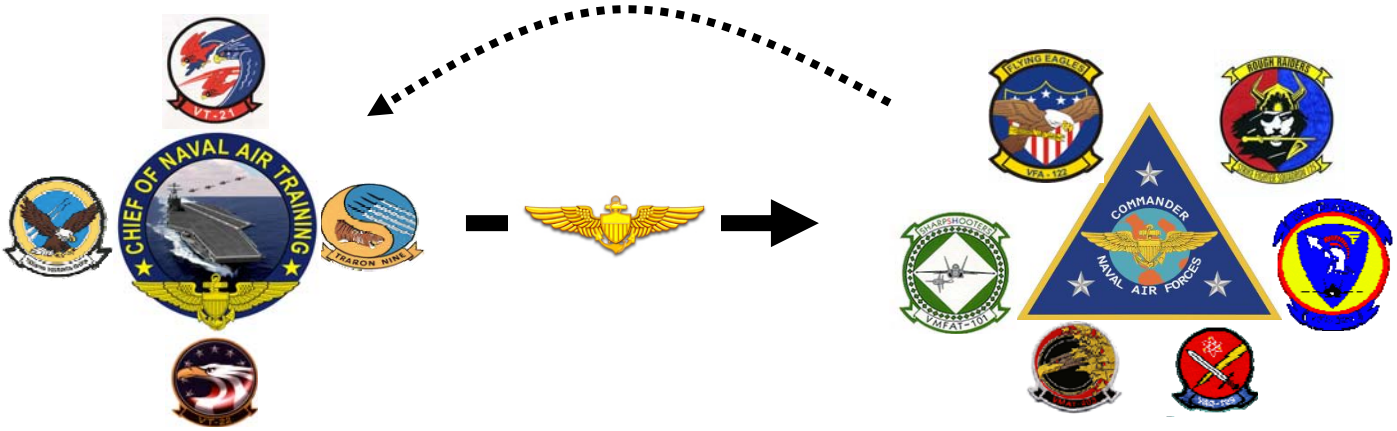
Training Wing One Quality Initiative



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Training Wing One Quality Initiative

17 October, 2008

Executive Summary

As part of Training Wing One's (TW-1) vision[1] of creating, "the world's finest Naval Aviators", this report's author was tasked with addressing the quality of TW-1's graduates. Though tasked by TW-1, the questions raised in this effort, and the data analyzed, quickly encompassed all of Task Group Tactical (TG TAC) and the Total Strike syllabus. The task was broken into three questions:

(1) Grades: What is the quality of all T-45 TG TAC graduates as ranked by the Fleet Replacement Squadrons (FRS)?

(2) Signals of Difficulty (SoDs): What are the causes and effects of UNSAT grades in the FRS?

(3) Attrition: Are there common causes for FRS attrition which could be addressed at the TG TAC level?

This report is the culmination of all analysis and includes recommendations for each command level of authority within the TRACOM. This executive summary summarizes the recommendations for the Chief of Naval Air Training (CNATRA) Staff.

Bottom Line Up Front: There is a tremendous amount of data generated by the strike FRSs that can provide feedback to TG TAC on the quality of our product and insight into how to improve. Standardizing how that data is generated, communicated back to CNATRA, analyzed, and then (most importantly) acting on that information, can provide an immediate and substantial improvement to our training at little to no monetary cost.

Data collection began in November of 2007 and finished in July of 2008. Data on TG TAC graduates who became FRS graduates was collected from TG TAC (VT-7, VT-9, VT-21 and VT-22) and all applicable FRS squadrons (VFA-106 (both C/D and E/F), VFA-122, VFA-125, VMFAT-101, VMAT-203 and VAQ-129). TG TAC information was found in hardcopies of *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms. FRS data was highly varied in both quality and quantity as each has a unique Student Control database. While all FRSs were able to rank their graduates over the last year and a half (at a minimum), the documentation for UNSATs was disappointing. Some had complete documentation (hard copies) going back for years, some for months, and one had nothing. Data collection on TRACOM graduates attrited in the FRS was hamstrung by privacy concerns precluding distribution of FNAEB (USN) and FFPB (USMC) findings. As a result, there is little attrition analysis and recommendations center simply on improved communication.

[1] The TW-1 Vision is to, "Safely and efficiently train the world's finest Naval Aviators, lead warriors in the 21st century, and integrate a Total Force of highly skilled active duty, reserve, and NSPS personnel, supported by contracts."

Grades

Grade data collection resulted in 476 'data points' or Naval Aviators with both a TRACOM composite score ('grades' for the purpose of this report) and an FRS ranking ('performance') among recent graduates. Composite score was the best predictor of performance though many variations of TRACOM phase and stage grades were investigated. Analysis of Carrier Qualification (CQ) stage grades and FRS CQ performance found low correlation between the two and very low performance variation overall. The VT squadrons produced Naval Aviators with different levels of performance at the FRSs. TG TAC graduates that completed the FRS between June 2004 and March 2008 were studied. **VT-9 and VT-22 graduates were most successful** (see Figure 1).

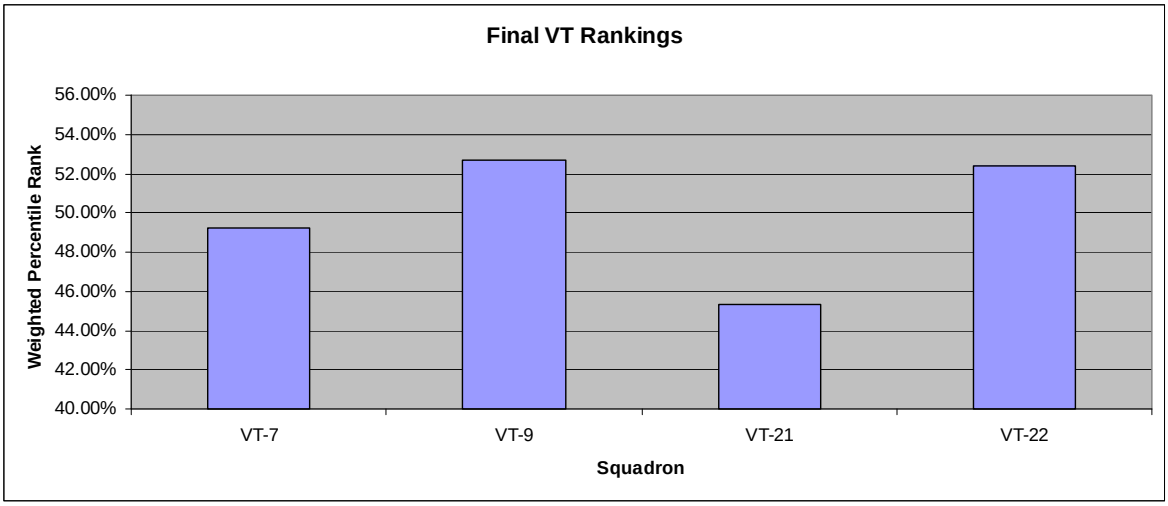

Figure 1. Vertical scale is average percentile ranking of TG TAC graduates sent to Strike FRSs.

Periodically measuring the performance of TRACOM graduates can provide a metric for rewarding squadron-level efforts to improve their students' performance. This is a quality metric describing the relative performance of TG TAC squadrons. There will not be an absolute qualitative metric (or a "quality entitlement line") until the FRS graduate is defined in an objective, quantifiable way. In the interim, **recommend that the selection for the CNATRA Training Excellence Award include this annually-derived metric**.

Subjectivity and the small deviation in grades from 1st to last make them a less powerful predictor of future performance. Overall, the variation in grades explains 25.8% of the variation[2] in FRS performance. **The predictive power of the current grading system does not warrant giving additional flights to seemingly weak TRACOM graduates in order to avoid more expensive UNSAT events in the FRS.** Also, the varied methods the FRSs use to collect and maintain performance data makes collection and analysis a time consuming and tedious affair degrading the data's timeliness for directing 'tactical level' VT squadron decision making.

[2] This percentage is the 'Coefficient of Determination' or more commonly the r^2, which is equal to the regression of the sum of squares (i.e., explained variation) divided by the total sum of squares (i.e., total variation). All regression analysis in this report is of a simple linear type. The r^2 referenced here is for Hornet FRSs only, for reasons explained in the report.

Accelerated implementation of a common database and more objective grading scale across the training continuum would enable a faster turnaround on higher quality data. This would open the door for tailored curriculums targeting students' weaknesses before they proceed to even more costly training in the FRS. **In the interim, recommend that CNATRA direct and assist the FRSs in development of a data-rich, standardized FRS Completion Letter which is CC'd to CNATRA for centralized data collection and more timely analysis**. Additionally, recommend CNATRA assist VFA-106 in their development of a more objective grading criterion, bringing our lessons from implementing the Multi Service Pilot Training System (MPTS).

Signals of Difficulty

FRS flight SoDs[3] were studied because they are documented, impact grades (and therefore final rankings), cost money to correct and increase time to train. SoD data points (470 in all) included a narrative of varying length, date, syllabus event, and Extra Training (ET) awarded. The SoDs were sorted by their cause(s) (Skill Errors, Admin Errors, Failure to Multi-Task, Formation Errors and Tac Admin Errors) and ET flight hour costs were computed. **The resulting information showed skill based errors in CQ are by far the most expensive (47.8% of the annual costs of ET flights were due to failure at the ship).** Multi Tasking and Formation are second and third. When CQ is removed it is possible to better see what errors occur where in the FRS Syllabus. Figure 2 shows an example of the analysis output. Skill (1st), Admin (2nd) and Multi Tasking (3rd) errors impact grades most significantly. Figure 3 shows the relative impact of various SoDs on grades and highlights consistent problem areas.

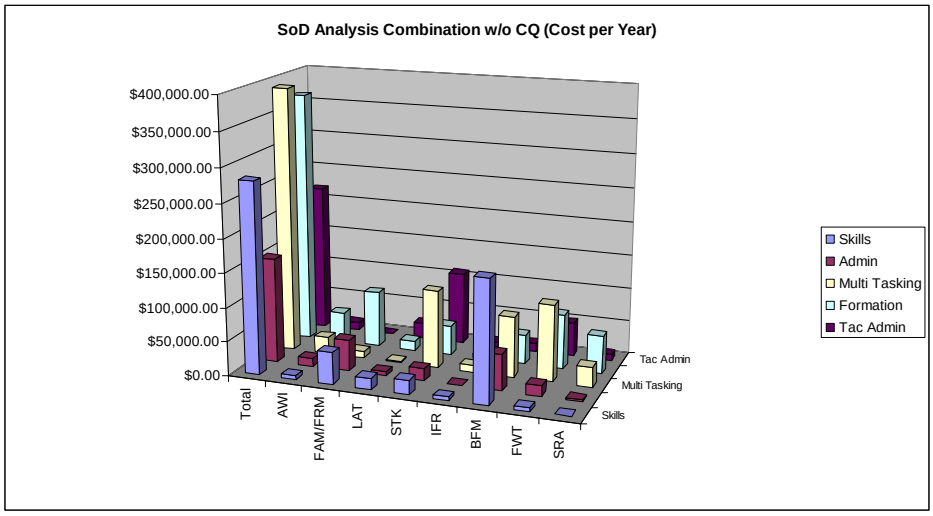

Figure 2. Graph compares SoD cause, FRS Phase and Annual Cost for VFA-122, VFA-125 and VFA-106C/D. CQ has been removed to better break out other SoD causes which are, in order, Multi Tasking, Formation, Skill Tac Admin and finally Admin.

Interpretation of the SoD analysis can range from the detailed ("7.5% of all SoDs involved either fuel or altitude warnings," for example) to the broad ("Poor formation keeping was the third costliest mistake after DQ at the boat and Tac Admin"). This can inform FRS-

[3] Simulator SoDs were collected, but not evaluated. NFO SoDs (both types) were forwarded to VT-86.

focused changes to TGTAC training at both the Wing ("Wing procedures for BINGO and LAW usage needs to mirror Hornet Stan; grading needs to zealously enforce those procedures.") and the CNATRA level ("More syllabus TACFORM hops may be warranted.").

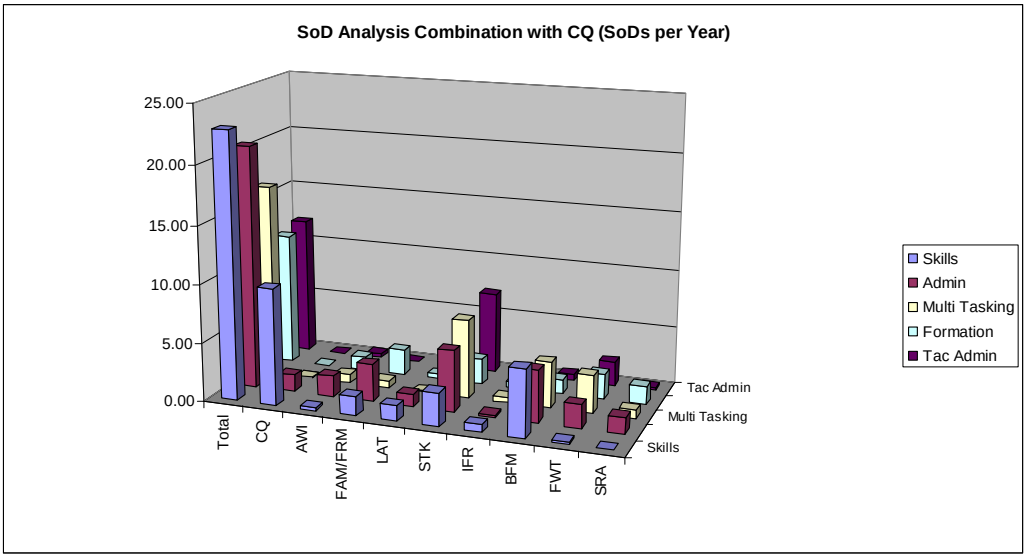

Figure 3. Graph compares SoD cause, FRS Phase and Annual number of SoDs for VFA-122, VFA-125 and VFA-106 C/D. Unlike the earlier slide measuring cost, this figure shows what mistakes impact grades the most.

Just as what is truly "UNSATISFACTORY" is subjective, the actual cause of the SoD (Skill, Admin, etc.) is somewhat subjective for this analysis.[4] Additionally, the variation in reporting quality among the various FRSs makes the generation of a truly all-inclusive look at SoDs impossible[5] at this time. However, the breadth and consistency of this analysis moves FRS feedback beyond urban legend and informal conference sidebars and is a rich source of suggestions for improvements to TG TAC. It should be continued.

Addressing the data shortcomings again requires CNATRA assistance and direction to the FRSs. **Recommend CNATRA, in conjunction with the Human Performance Center and the applicable FRSs, coordinate the development of a standardized SoD Incident Form (example included in the report).** Ideally the form would include a manageable list of proximate SoD causes to be selected by the FRS IP and flight/simulator hours for any ET awarded. This information, readily available at the source, would remove TRACOM interpretation of the data and allow for simplified compilation and improved timeliness. **Further recommend CNATRA distribute the 'SoD Report' to TG TAC on six month intervals allowing Wing level action on FRS feedback.** Over time these reports will identify trends and, hopefully, document improvements to TG TAC graduates.

[4] SoDs were categorized by this report's author. The author has 2400 Hornet hours, seven deployments, 700 traps, and was a Wing Qualified LSO. He was a Strike Lead both as a JO and as a Department Head. Additionally he was a Strike Fighter Tactics Instructor with instructor tours with the Strike Fighter Weapons School, Pacific and in the Fleet. He has instructed in the Training Command for one year.

[5] VMAT-203 had no SoD records. VMFAT-101 had records covering less than a year. VFA-106 E/F SoD records were not applicable as that FRS was mostly transitioning F-14 squadrons to the Super Hornet.

Attrition

The study found 61 examples of TGTAC graduates with very low grades (NSS <40 equating to a 15th percentile) that graduated from strike FRSs. These graduates finished the FRSs in the 26th percentile, on average. While "regression to the mean" is expected when using one distribution to predict results on another, this finding shows that even poor performers often go on to perform acceptably in the FRS[6]. **This study is incomplete, however, as there is no data on TGTAC graduates that did not complete the FRS**. The impact to VT squadron rankings caused by this missing data is currently unknown.

This gap in the data was due to privacy concerns over the distribution of sensitive Performance Board results. In light of CNATRA's position as CNAF's Deputy for Training there is a case to be made that FNAEB and FFPB results can be distributed to TGTAC for the purposes of investigation of FRS failures' performance in the TRACOM. It is particularly true when the failure resulted from flight performance. This is less true for Human Factors beyond the scope of the TRACOM, however. Ultimately CNATRA should make the call on any follow-on TG TAC investigation and impact to squadron rankings.

Attrition from the FRS has a fiscal impact meeting Class Alpha mishap criteria. This fact alone could justify further investigation by TG TAC. But these investigations, conducted by the responsible squadron, will also provide 'Lessons Learned' to all TGTAC Commanding Officers on seemingly adequate graduates that were unable to succeed in the FRS. **Recommend CNATRA facilitate the distribution of relevant Performance Board results.**

Conclusion

Mandating, standardizing and facilitating improved communication between TG TAC and the FRSs can provide an improved product to the Fleet in the near term at low cost. Assessing a VT squadron's quality performance can provide the impetus to overcome organizational inertia and affect change directed at improving quality. Looking at the specific types of failures in the FRSs can provide the information required to create TRACOM changes aimed at improving FRS performance. Allowing TG TAC insight into FRS failures can help VT Commanding Officers make the difficult decision to attrite an SNA in the TRACOM, vice passing them on for more expensive training in the FRS.

The ideas and methodologies spelled out in this report have applicability beyond TG TAC. Recommend each TRAWING explore ways to best make these ideas work with the FRSs they serve.

[6] VAQ-129's #16 graduate had a TRACOM Composite score of 140.

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Grades

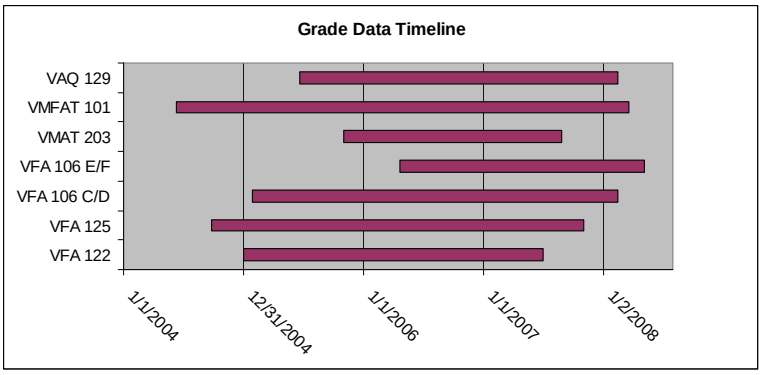
Analysis of TG TAC Grades and FRS Performance

TG TAC graduates that completed the FRSs roughly between June 2004 and March 2008 were studied. Grade data collection resulted in 476 'data points' or Naval Aviators with both a TRACOM composite score ('grades' for the purpose of this report) and an FRS ranking ('performance'). This constitutes 74% of the total TG TAC production provided to the FRSs for their June 2004 to March 2008 production[7]. Composite score was the best predictor of performance though many variations of TRACOM phase and stage grades were investigated. Analysis of Carrier Qualification (CQ) stage grades and FRS CQ performance found low correlation between the two and very low performance variation overall. The VT squadrons produced Naval Aviators with different levels of performance at the FRSs. VT-9 and VT-22's graduates were most successful.

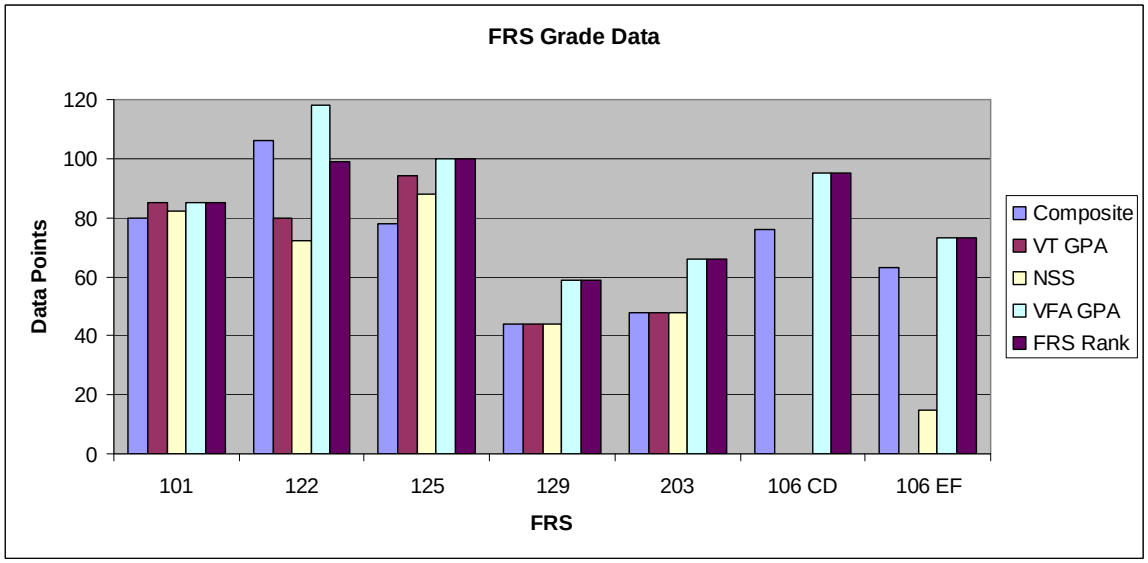
Data Collection and Analysis Methodology

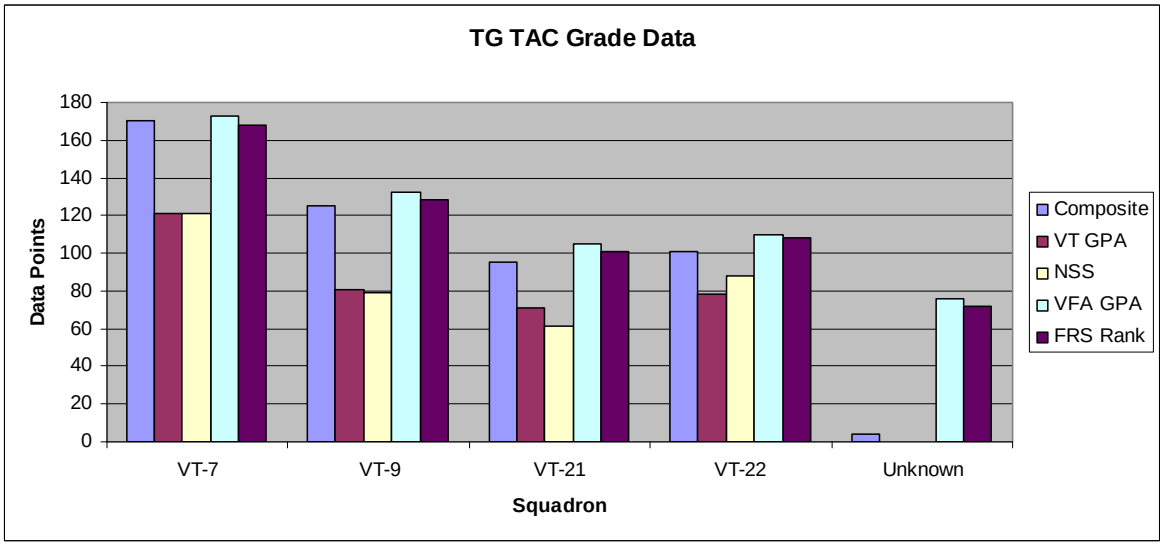
Data collection began in November of 2007 and finished in July of 2008. Data on TG TAC graduates who became FRS graduates was collected from TG TAC (VT-7, VT-9, VT-21 and VT-22) and all applicable FRS squadrons (VFA-106 (both C/D and E/F), VFA-122, VFA-125, VMFAT-101, VMAT-203 and VAQ-129). TG TAC information (Composite score, Naval Standard Score (NSS) and VT GPA) was found in hardcopies of *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms. This was not ideal but mandated by the facts that the Total Information Management System (TIMS) database did not go back far enough and the Total Integration System (TIS) was archived and inaccessible. FRS data (Final Ranking and GPA) was highly varied in both quality and quantity as each has a unique Student Control database. However, all FRSs were able to rank their graduates over the last year and a half (at a minimum).

Data collection and analysis was conducted in two phases. In Phase 1, VFA-122 and VFA-125 were studied in great depth. This Phase focused on discovering what data was important and what analysis produced the best information. In Phase 2 the lessons learned earlier were applied to the other five FRSs served by TG TAC. The figures below show what data was collected from which squadrons and the dates the 'data points' completed their respective FRSs.

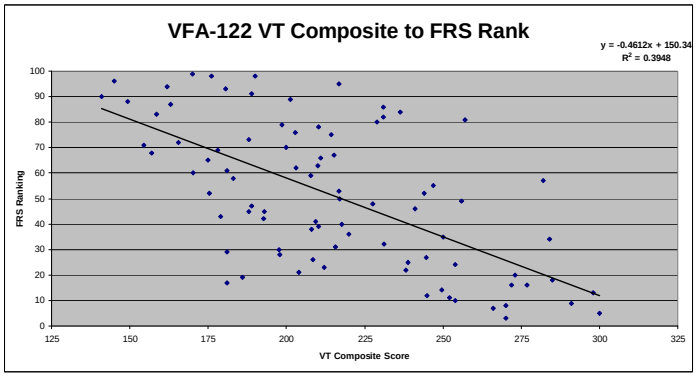


[7] The remaining 26% either attrited or had incomplete data from TG TAC and/or the FRS.





Deciding What Data to Compare. Linear regressions are used throughout the analysis to compare grade data (GPA, NSS, Composite, CQ GPA, CQ Boarding Rate, stage grades, etc.) with performance data (GPA, Final Ranking, CQ GPA, CQ Boarding Rate, stage grades, etc.). These regressions were run with a group of grade data on the X axis and performance data on the Y axis creating a scatter diagram. Linear regressions provided a formula for the line which best described the scatter diagram. The linear regression also provided a percentage correlation metric. This percentage is the 'Coefficient of Determination' or more commonly the r^2, which is equal to the regression of the sum of squares (i.e., explained variation) divided by the total sum of squares



(i.e., total variation). Said more simply, it allows one to say, "XX percentage of the variation in FRS ranking may be explained by VT Composite Score." All regression analyses in this report are of a simple linear type.

VT and FRS GPA were compared but never seriously considered as GPAs move up and down with changes in IP manning and the syllabi (this is the reason for NSS). There was an attempt to create a superior correlation by combining certain VT stage GPAs and then comparing them to FRS Ranking. For VFA-122, when we combined VT GPAs in BI, AN and Formation we were able to improve on the Composite score to FRS Rank correlation by 1%. Combining BI, ONAV and WEPS improved the VFA-125 correlation by 1%. The unexciting correlation was likely due to having to use VT stage GPAs. Very few of the *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms contained stage specific NSSs. Stage-specific NSSs could have broken out the data more and, perhaps, improved correlation.

This effort was abandoned as creating a unique score for each FRS was a clumsy solution with seemingly little return on the effort. However, it is interesting to note that the BI GPA alone provided a correlation near 25% for both VFA-122 and VFA-125.

Composite score was picked because it produced a slightly better (~3%) correlation to FRS Rank than NSS. Additionally, the composite score was easier to obtain thereby providing more data points.

Comparing TG TAC Squadrons. Final Ranking can be seen as a standardized test, of sorts, taken by each TG TAC graduate. The graduates come from four different TG TAC squadrons with four different groups of IPs, cultures and grading standards. At each FRS, however, they are graded by the same IPs with the same culture and standards.

The VT squadron average percentile FRS ranking information has been evaluated by LT Chris Foster, MSC, USN, CPT, Ph.D. of the Human Performance Center, CNATRA Detachment. Using industry-standard confidence levels, he found that the observed differences among squadron averages are not large enough to be meaningful. Additionally,

> *"We used confidence intervals to estimate the range within which each squadron's average percentile rank is likely to fall. Consistent with industry standards, we set 95% confidence intervals. This means that we can be 95% confidence that the squadron's average falls within this range. Once we have established confidence intervals we can use them to evaluate whether or not there are differences across squadrons. If Squadron B's average falls outside the confidence interval established for Squadron A, then we can conclude with 95% confidence that there is a difference between the two squadrons. However, if Squadron B's average falls within the confidence interval established for Squadron A, then we cannot conclude that there is a difference between the two squadrons. This does not mean that there is no difference between the two squadrons, it means that the available data is insufficient to detect a difference if indeed a difference exists.*
>
> *In our analysis, the differences among squadron average percentile ranks were found to be non-significant. That is, based on available data we cannot detect a difference among the squadron averages. This does not mean that there is not a difference, only that a difference, if one exists,*

cannot be detected. One possible explanation for this finding is the relatively low availability of student data most noticeably for VT-21 and VT-22.[8] *"*

To put it another way, you can't say, "the difference among FRS rankings isn't random," with a 95% confidence. These confidence intervals, designed to provide near-incontrovertible data, are perhaps too high a bar for the training of Naval Aviators in the art of war with our current grading system.

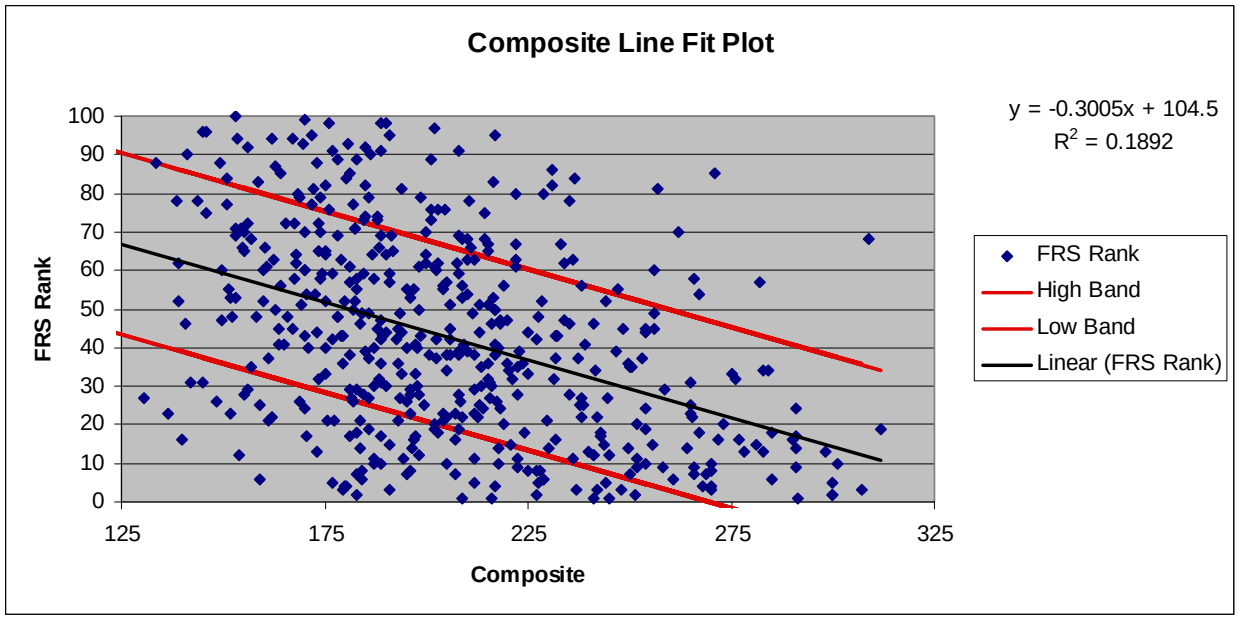
Regardless, the 'standardized test' of FRS IPs is a measure of the relative quality of each TG TAC squadron's product, however imperfect that quality metric may be.

[8] LT Chris Foster, CNATRA N7P, in an email dated 13AUG08, 1601.

Grade Analysis Results

This analysis produced three significant findings. First, while Navy Hornet FRSs show good correlation between TG TAC grades and FRS performance, the current grading system lacks the predictive power to defend spending more TG TAC flight time on seemingly weak graduates in order to avoid more expensive remedial training in the FRS. Second, VT CQ performance does not predict FRS CQ performance. Thirdly, VT-9 and VT-22 graduates performed best in the FRSs.

Correlation between VT Composite and FRS Ranking. Overall, Composite scores explain 18.92% of the variation in FRS Rankings. This leaves a very large percentage to be explained by such things as Human Factors, an uneven distribution of talent, weaknesses in the current grading system and potential mismatches between what TG TAC taught and what the FRS needed. The graph below shows all data points (the 'High' and 'Low' bands are approximately one standard deviation).



The table below on the left shows the r^2 for each FRS squadron. To a certain extent, this correlation can be thought of how well the FRS agrees with TG TAC's assessment of the Naval Aviator. Note that there is a large difference in the r^2 between Navy Hornet FRSs and the r^2 for VAQ-129, VMAT-203 and VMFAT-101. The table on the right shows the r^2 for each TG TAC squadron. Looking at the data in a slightly different way, this correlation could be thought of as how well the VT squadron predicted the future performance of their graduates. Interestingly, the order is similar to the VT squadron average percentile FRS ranking.

FRS	R²
VFA-122	0.3948
VFA-106 E/F	0.3855
VFA-125	0.3446
VFA-106 C/D	0.3209
VMFAT-101	0.1023
VMAT-203	0.0821
VAQ-129	0.0545

Correlation using all data.

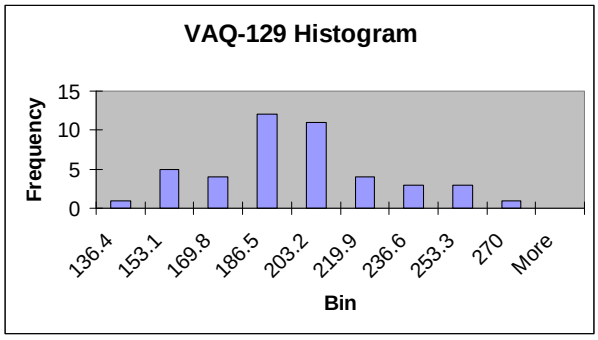
TG TAC	R²
VT-22	0.3278
VT-9	0.2715
VT-21	0.136
VT-7	0.1345

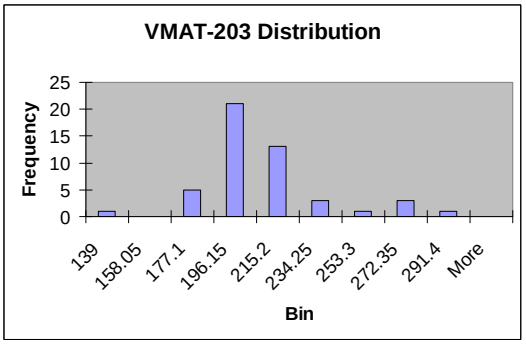
Correlation using all data.

Almost all of the correlations were improved when the FRS scatter plots were regressed by VT squadron. The average improvement of 4.5% demonstrates that you can better predict a TG TAC graduate's performance if you know their VT squadron. And that, in turn, implies that the VT squadron matters when it comes to the performance of a TG TAC graduate.

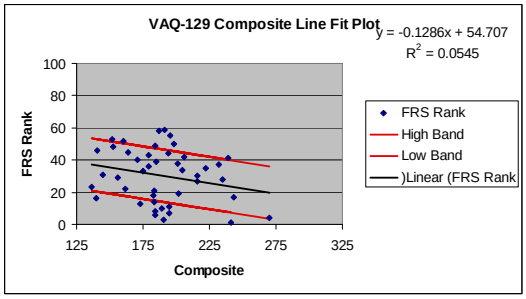
We looked at the data points plotted outside the red lines (one standard deviation) in an effort to 'clean up' the r^2. We were looking for some common cause for the outliers driving the relatively low overall correlation. More often than not, the interesting data points came from one of three squadrons: VMAT-203, VAQ-129 or VMFAT-101.

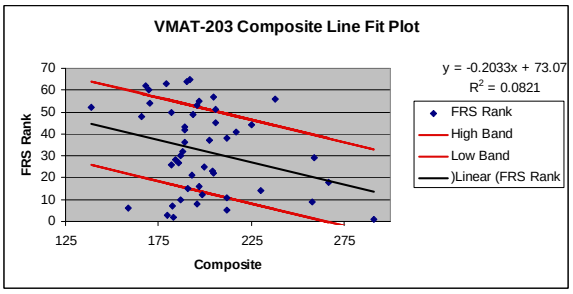
The poor correlation for VMAT-203 and VAQ-129 can be partially explained by the fairly narrow distribution of TG TAC graduates sent to those FRSs. This narrow band competed against each other and not against many of the extremely strong players they had competed against in the TRACOM. Also, these two syllabi are the most dissimilar from TG TAC (hinting at the importance of TG TAC – FRS alignment). As an example of what can happen in this kind of an environment, VAQ-129's number 16 graduate had a composite score of 140. The figures below show the distribution for these two FRSs.



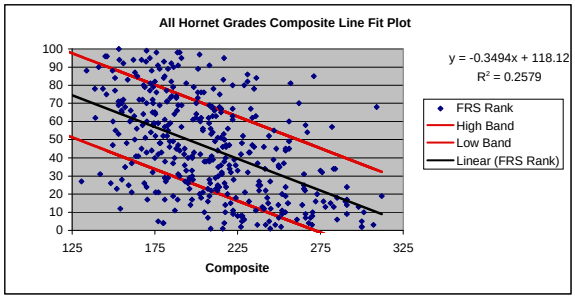


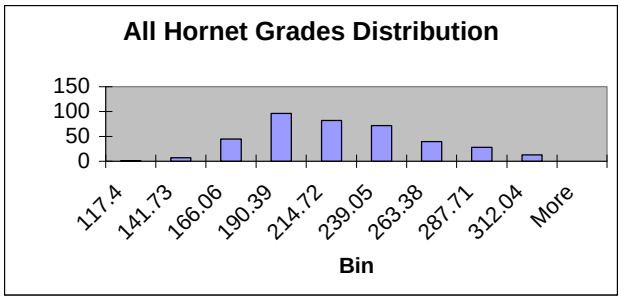
The figures below highlight the difficulty in predicting Harrier and Prowler performance.



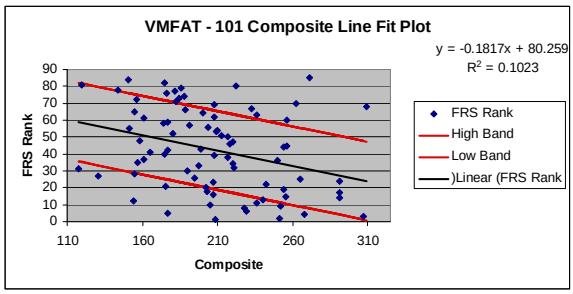


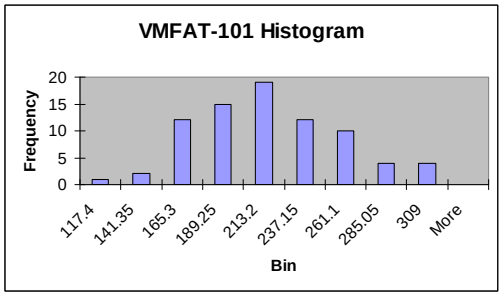
Removing those two squadrons left us with Hornets only. Almost three quarters of TG TAC graduates go on to Hornets. The figures below show the distribution of talent to Hornets and the better correlation between grades and performance.



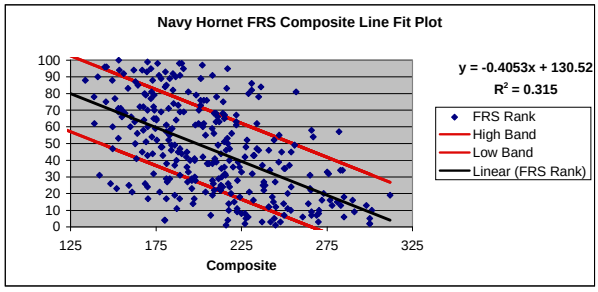


For reasons not immediately apparent to this author, VMFAT-101 correlation is extremely low despite receiving a normal distribution of talent from TG TAC and flying a standard Hornet FRS syllabus, not unlike TG TAC's. The figures below summarize the information.





Navy Hornet FRSs combined to produce a much better correlation, 31.5%, than the combination of all FRSs. The figures below summarize this information.



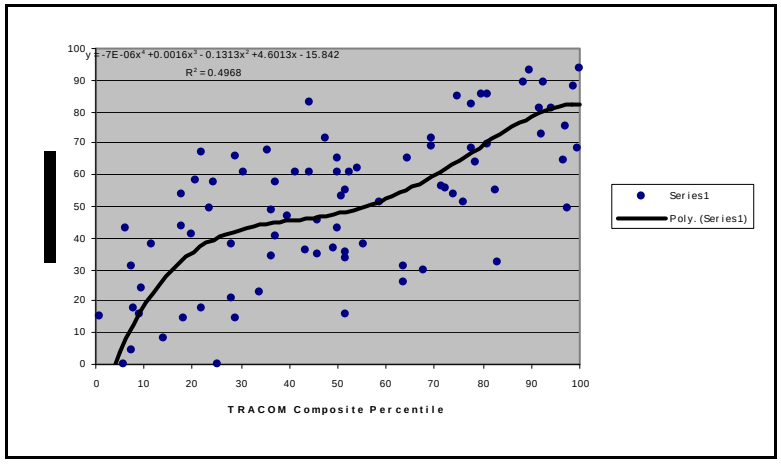
TG TAC	r2
VT-22	0.4982
VT-9	0.3492
VT-21	0.3051
VT-7	0.2643

Correlation using Navy Hornet FRSs.

LT Joseph Furco conducted and wrote *An Analysis of VFA-122 Category One Replacement Pilot Statistical Performance* during his tenure as the VFA-122 Performance Review Officer. His findings show the potential to better predict which students will experience difficulty in the FRS. His recommendations include providing extra instruction *before* expensive SoDs begin. Though he didn't know it at the time, he was working with the best correlation between VT grades and FRS performance (~40%). As a result he was able to better predict which students were likely to receive SoDs and how many they would receive.

"Low TRACOM scores still yield low (relative) FRS scores up to about the 25th percentile. Interestingly, the trend or curve is comparatively flat from the 25th percentile through

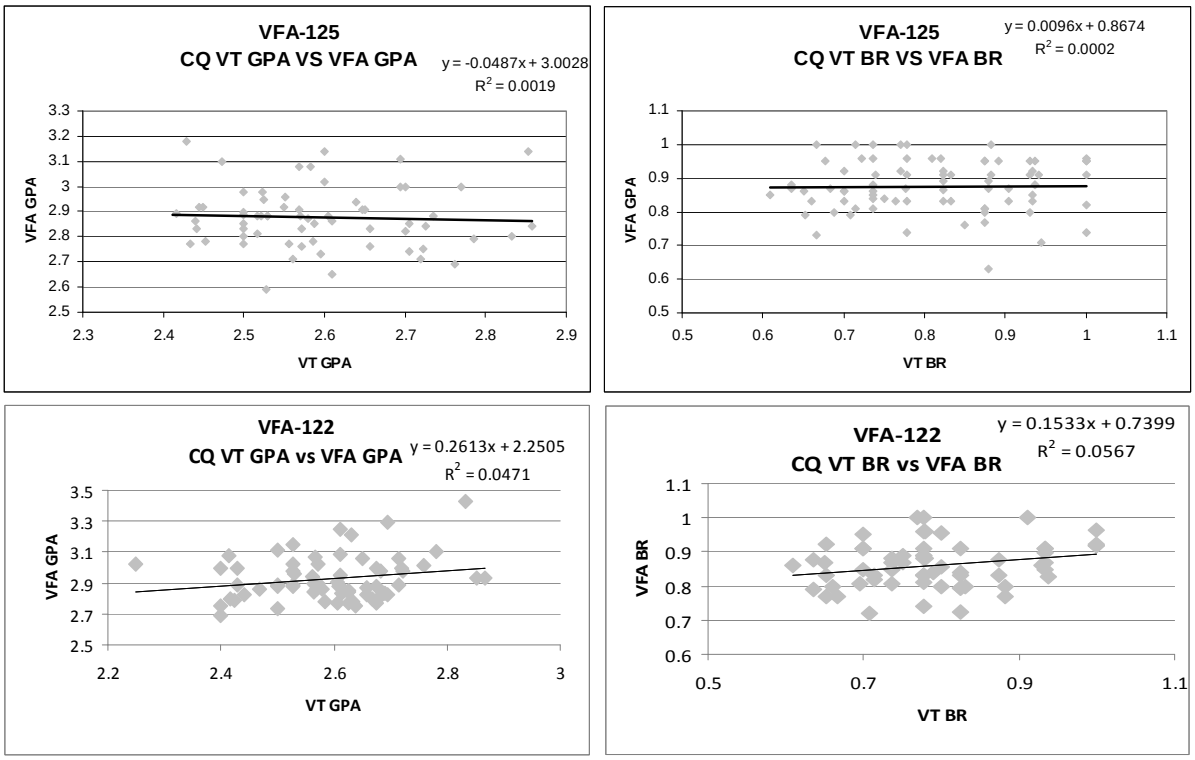
the 70th percentile before climbing more rapidly again. This shows that the middle 45% of TRACOM NSSs are mostly indistinguishable by GPAs. The middle 45% of students see only a 20 percentile delta in final FRS GPA (40th percentile through 60th percentile) between one another. The bottom 20% of students by NSS are absolutely the students to pay more attention to (addressed in later sections), and that equates to approximately a 180 TRACOM Composite Score. Although there will always be some statistical outliers, students checking in to the FRS with a Composite Score greater than 185-190 demonstrate performance consistent with VFA FRS requirements.



An RP's TRACOM Composite Score is also a fine indicator of SODs. As aforementioned, approximately 60% of RPs earn at least one SOD in their syllabus. However, those students with an NSS below 190 (28th percentile and lower) are approximately 85% likely to receive at least one SOD. Of these students that receive a SOD, they are 70% likely to receive at least one additional SOD and 50% likely to receive 3 or more SODs. This is a significant departure from the baseline SOD data that encompasses the entire cross-section of students. RPs in the lower 20th percentile of NSS scores account for over 40% of all SODs received and the lower half of NSS scores accounts for over 75%. The SOD-NSS danger zone is likely to be around an NSS of 190 (28th percentile). These students represent nearly 60% of all SODs with disproportionately higher occurrences of multiple SODs."

Combining LT Furco's analysis with the SoD analysis in this report provides the basic elements required to connect low VT grades with increased cost to train in the FRS. And that connection is required to justify spending extra T-45 OPTAR on TG TAC graduates with low composite scores before they go on to the FRS. Done properly, this has the potential to both improve quality to the Fleet and lower cost to the NAE. Unfortunately LT Furco was working with the tightest VT-FRS correlation and we still do not have a sufficiently compelling argument Driving an 85% chance of a SoD down to a 60% chance is just not worth the effort. **This low correlation is due to the current grading system, making it the fundamental problem.**

Carrier Qualification. Phase 1 work on CQ resulted in 131 complete data points. Complete data points had VT CQ GPA (grades at the ship, not CQ Stage GPA), VT Boarding Rate (BR), FRS CQ GPA, and FRS BR. There were 179 FRS data points from VFA-122 and VFA-125 as their CQ records were more complete ('CQ Rank' scores below are from this more complete data set).



There was low correlation (r^2<.05) between VT grades and FRS performance regardless of how the data was sorted (the Squadron Reports in the appendix includes an attempt to rank the CQ grades and then run a liner regression to improve correlation). This low correlation was most likely due to having to compare GPAs to GPAs and the relatively 'tight grouping' of those GPAs in CQ. Very few of the *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms contained stage specific NSSs which could have broken out the data more and, perhaps, improved correlation.

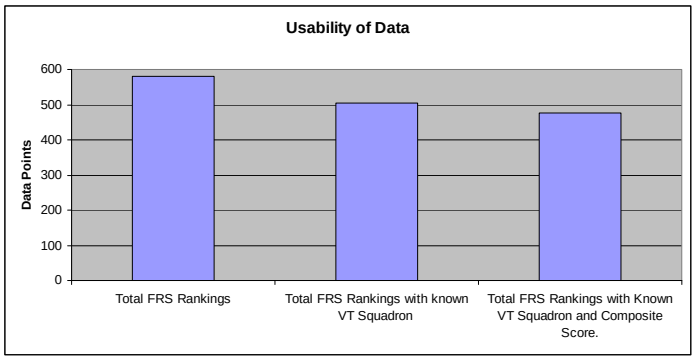
VT-7's graduates were the most successful in Lemoore CQ, however.

VFA-125									
	VT		VFA						
Squadron	GPA	BR	GPA	BR	Day GPA	Day BR	Nt GPA	Nt BR	CQ Rank
VT-7	2.62	82.3%	2.91	88.7%	2.90	90.7%	2.92	86.2%	41.1
VT-9	2.60	80.5%	2.87	88.2%	2.89	90.8%	2.84	84.0%	46.0
VT-21	2.58	76.8%	2.87	87.5%	2.89	90.2%	2.83	84.5%	47.4
VT-22	2.50	88.1%	2.87	87.6%	2.85	89.1%	2.88	85.5%	49.8
VFA-125	2.60	81.4%	2.88	88.0%	2.89	90.3%	2.87	85.1%	45.8
STD	0.11148549	0.105332743	0.125171058	0.075250931	0.124707325	0.072810994	0.19402384	0.124664629	
	Only one data point								

VFA-122									
VT			VFA						
Squadron	GPA	BR	GPA	BR	Day GPA	Day BR	Nt GPA	Nt BR	CQ Rank
VT-7	2.612	78.7%	2.969	88.4%	2.987	91.1%	2.956	86.1%	41.3
VT-9	2.596	74.4%	2.912	85.9%	2.957	89.9%	2.863	80.7%	49.4
VT-21	2.506	84.8%	2.819	88.3%	2.820	89.7%	2.919	88.2%	48.6
VT-22	2.595	79.7%	2.898	83.4%	2.891	84.1%	2.909	84.5%	54.8
VFA-122	2.591	79.1%	2.918	86.8%	2.934	89.2%	2.920	84.9%	47.0
STD DEV	0.115911681	0.099446168	0.20042	0.072684525	0.214468652	8.9%	0.19228	0.11443	

Further investigation of CQ grades was abandoned in Phase 2 due to the low correlation between VT grades and FRS performance in CQ.

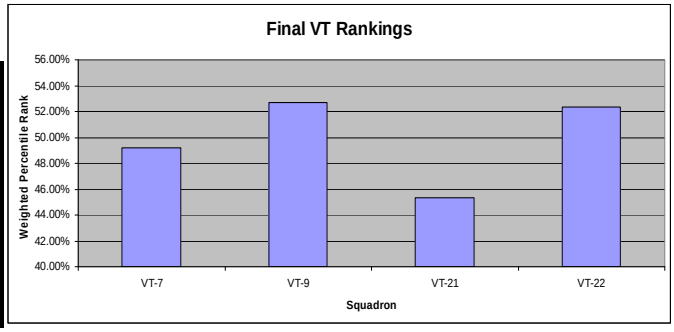
VT-9 & VT-22 Graduates were Most Successful. The graph below shows the dataset used for determining VT squadron ranking. The first bar shows the total number of FRS rankings. (VFA-125 ranked their last 100. This was added to VAQ-129 who ranked their last 59, etc., for a total of 579.) The second bar shows, of that first group, how many had data on their VT squadron of origin (505). The difference between the first and second bars is due to Naval Aviators in the FRS to transition from one airframe to another (hence no VT data) and record keeping at both the FRS and the TRACOM squadron (again, no VT data). The third bar is the 476 data points used to find the grade and performance correlations. The difference between the second and third bar is due to poor record keeping.



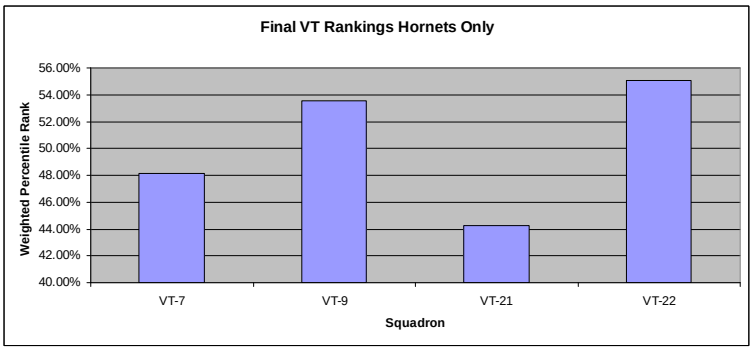
The second bar is the data set used for VT squadron ranking, but they kept their original FRS ranking. For example, VT-9 graduate ENS Smith (not his real name) finished 100 out of 100 from VFA-125. Of the 100 completers, 78 had a VT squadron of origin. 78 data points were used to find the average ranking for each VT squadron from VFA-125. But ENS Smith, and by extension VT-9, still kept his rank of 100.

The rankings were then converted to percentiles to account for the variation in FRS throughput (VAQ-129 had zero rankings greater than 59, but VFA-125 had 41). Next the average percentile for each FRS was weighted by the percentage of TG TAC graduates that went to that FRS over the last five years to account for the different amount of data each Student Control office was able to produce. This last step weighted the percentiles by the FRS production. The figures below show the results.

Final VT Rankings	Total %	Hornet %
VT-7	49.19%	48.13%
VT-9	52.72%	53.56%
VT-21	45.32%	44.22%
VT-22	52.37%	55.05%



VT-22 graduates are the most successful at the Hornet FRSs. See the figure below.



Recommendations

NAPP has done a commendable job providing efficiency metrics. CNATRA and Wing Commodores have used these metrics to motivate TG TAC Commanding Officers to improve production efficiency. At the same time, squadron level efforts to improve production effectiveness, or quality, lacked metrics. This has made quality initiatives a lower priority for busy COs. The TW-1 Quality Initiative was begun to provide TG TAC COs the metrics, tools and motivation to tackle the quality half of their tasking. The squadron ranking is designed to highlight those that succeed and to more closely connect TG TAC with the FRSs we serve.

It takes about three years to get a TG TAC graduate from the street to the Fleet. This can discourage efforts to improve quality as the time between making a change and seeing improved quality scores can be longer than the average CO's tour. Improving quality will require patience and strong, consistent support up and down the chain of command. The metrics in this report are a baseline for that effort.

For TG TAC Squadrons. The squadron ranking is not perfect. It lacks the statistician's 95% confidence. Some data is missing. FRS attrition was not counted against those that failed to produce a successful Naval Aviator. However, the 505 data points represent a full two and a half years of production and close to two billion dollars. This is the state-of-the-art in FRS feedback on our product and there are valuable lessons to be learned here. Recommend an evaluation of where your squadron is in relation to other TG TAC squadrons, and why.

For TG TAC. Provide the consistent motivation and support required to achieve improved quality of our graduates.

For CNATRA. Periodically measuring the performance of TRACOM graduates can provide a metric for rewarding squadron-level efforts to improve their students' performance. This is a quality metric describing the relative performance of TG TAC squadrons. There will not be an absolute qualitative metric (or a "quality entitlement line") until the FRS graduate is defined in an objective, quantifiable way. In the interim, recommend that the selection for the CNATRA Training Excellence Award include this annually-derived metric.

Subjectivity and the small deviation in grades from 1st to last make them a less accurate predictor of future performance. The predictive power of the current grading system does not warrant giving additional flights to seemingly weak TRACOM graduates in order to avoid more expensive UNSAT events in the FRS. Also, the varied methods the FRSs use to collect and maintain performance data makes collection and analysis a time consuming and tedious affair degrading the data's timeliness for directing 'tactical level' VT squadron decision making. Accelerated implementation of a common database and more objective grading scale across the training continuum would enable a faster turnaround on higher quality data. This would open the door for tailored curriculums targeting students' weaknesses before they proceed to even more costly training in the FRS.

In the interim, recommend that CNATRA direct and assist the FRSs in development of a data-rich, standardized FRS Completion Letter which is CC'd to CNATRA for centralized data collection and more timely analysis.

The analysis in the report had little success connecting TG TAC grades with FRS performance at the individual VT stage level of detail due to poor data quality (VT Stage NSSs, FRS Stage Rankings). However, CNATRA mandated, centralized collection will provide many more data points of higher quality perhaps helping improve overall correlation. This could very well help identify VT squadrons that are 'Centers of Excellence' for particular missions (CQ, Weps, ACM, etc.). In the future, more advanced statistical analysis coupled with this improved data may justify targeted training for weak TRACOM graduates.

Additionally, recommend CNATRA assist VFA-106 in their development of a more objective grading criterion, bringing our lessons from implementing the Multi Service Pilot Training System (MPTS).

Signals of Difficulty

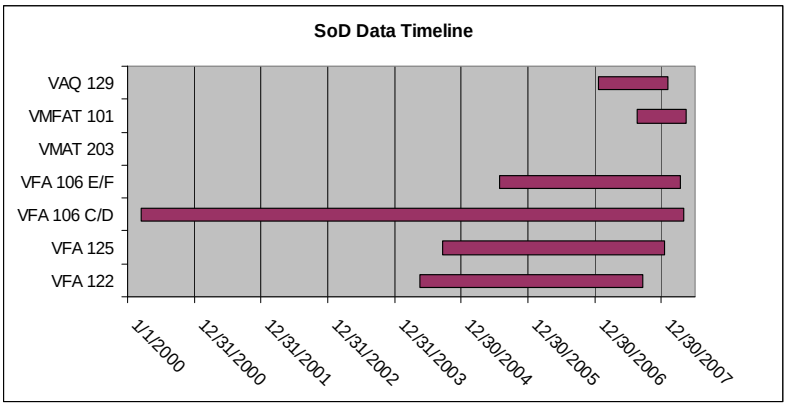
Analysis of UNSAT Grades

FRS flight SoDs were studied because they are documented, impact grades (and therefore final rankings), cost money to correct and increase time to train. SoD data points (470 in all) included a narrative of varying length, date, syllabus event, and Extra Training (ET) awarded. The SoDs were sorted by their cause(s) (Skill Errors, Admin Errors, Failure to Multi-Task, Formation Errors and Tac Admin Errors) and ET flight hour costs were computed. The resulting information showed skill based errors in CQ are by far the most expensive (47.8% of the annual costs of ET flights were due to failure at the ship). Multi Tasking and Formation are second and third. Skill (1st), Admin (2nd) and Multi Tasking (3rd) errors impact grades most significantly.

Data Collection and Analysis Methodology

SoD Data came from Student Control offices and varied in format from hard copies to Excel and Access databases. Below are the total number of SoDs from each FRS and the timeframe from the first to last SoD from that FRS. Simulator SoDs were collected, but not evaluated. NFO SoDs (both types) were forwarded to VT-86.

FRS	SoDs
VAQ-129	17
VMFAT-101	18
VMAT-203	0
VFA-106E/F	29
VFA-106C/D	209
VFA-125	58
VFA-122	139
	470



Every pilot flight SoD was evaluated for cause. VMFAT-101 was not evaluated for cost due to the limited number of SoDs collected. VFA-106E/F cost analysis showed a radically different distribution across the causes. Further investigation showed that there was a high percentage of F-14 transitions during the sample time period, explaining the low number of formation SoDs. VFA-122, VFA-125 and VFA-106C/D were evaluated individually and then combined in an attempt to provide a composite picture of annual Hornet SoDs. VAQ-129 was evaluated for both cause and cost. The Squadron Reports in the appendix contain individual FRS SoD analyses.

Cause. Each SoD was sorted amongst the five SoD reasons by this report's author. On average there were 1.55 reasons for each SoD. The five SoD categories were:

Skills. This encompasses not only basic airwork, necessary to fly well in IFR conditions and behind the boat, but also advanced airwork required to fight and bomb well. These FRS SoDs are for poor execution of procedures first taught in TG TAC.

DQ at the ship (involved in 16.4% of all 470 SoDs)

Ditch Mechanics (6.2% of the total and 39% of BFM stage SoDs)
"Basic Airwork" in the SoD narrative
Energy management (split 50/50 with Multi Tasking)
Poor Hits
Poor roll in mechanics

Admin. This is best described as the things graded on every TRACOM hop under "Headwork" and "Procedures."

Checklists (5.3%)
Bingo Bug / Altitude Warnings (7.5%)
Headwork and preflight prep (5.1%)
Course Rules (Typically on det; STK dets were worse than FWT)

Multi Tasking. This type of SoD results from an inability to do two (or more) things at once. This goes to the heart of what it means to be a Strike Fighter pilot. As a result it is a contributing factor in a large percentage of SoDs.

"Task saturated" or "Behind the jet"
Deck busts (5.1%)
Energy management (split 50/50 with *Skills*)
Low situational awareness
Notch mechanics (split 50/50 with *Tac Admin*)
Dropping without clearance (8.3% of STK SoDs)
Dropping on the wrong target
Slow tactical scan
Low pulls

Formation. (13%) Parade, TAC Form and Rendezvous.

"Near Midair"
Formation keeping
TAC Form (7%)
Blind, no mutual support at the merge
Rendezvous (4.9%)

TAC Admin. These SoDs are for procedures taught for the first time in the FRS

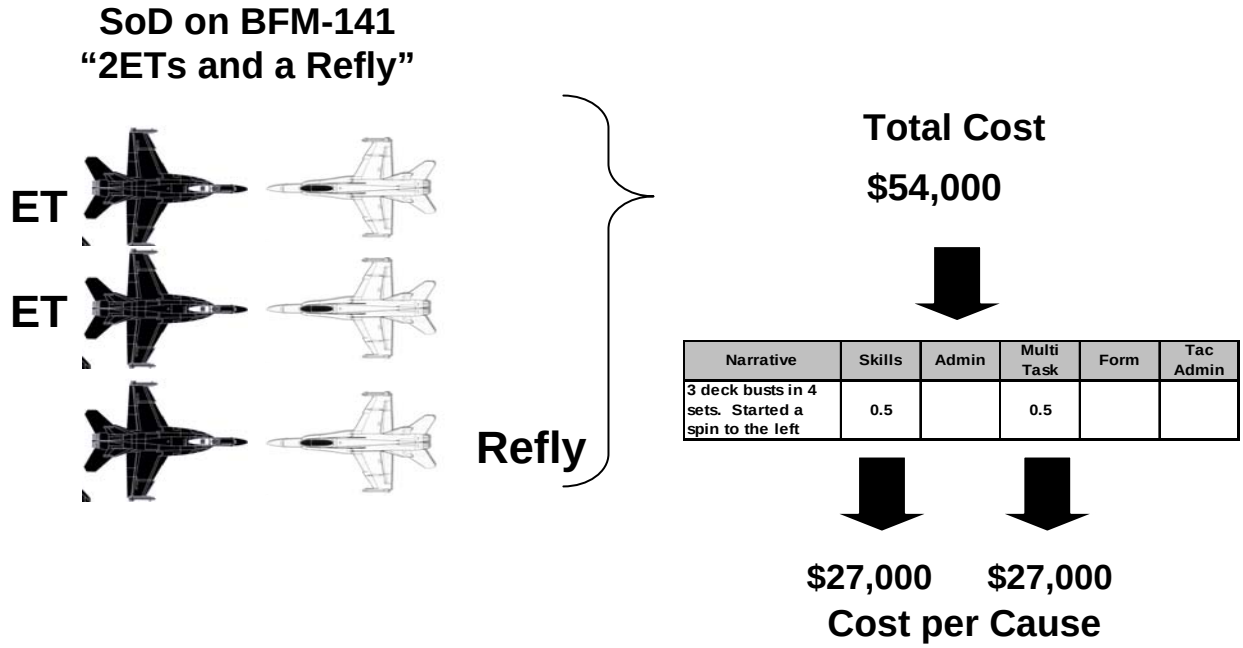
A/G, A/A and LATT checklists
"TAC Admin errors"
Notch mechanics (split 50/50 with *Multi Tasking*)
Poor system utilization (CAS 8.3% of STK stage SoDs)
Radar mechanics

Costs. This analysis assumed the ET awarded on the SoD write up was executed. The current FRS syllabus was referenced for total aircraft sorties required because most FRS sorties are multi-plane events. The data for division sorties was 'smoothed' to account for other Replacement Air Crew (RAC) getting training simultaneously with the ET. Costs of support F-5s and T-34s were investigated for VFA-122 and VFA-125 but found to be small (3% and 1% increase respectively) and not pursued further. Support sortie (leads, bandits, etc.) assumptions had to be made for those squadrons with data going back several years as the FRS syllabus is relatively fast changing. Those assumptions were based on the FRS stage and the SoD narrative.

Total flight hours were based on the following flight time assumptions:

A/C & Mission Type	Flight Time
F/A-18 A/B/C/D	1.2
F/A-18E/F EA-6B	1.5
FCLP / CQ PERIOD	0.8

The cost per flight hour was taken from OSD reimbursement rates from the OSD Comptroller.[9] Next the total ET cost was distributed amongst the SoD causes by the applicable percentage to generate the SoD's cost per cause. See the example below.



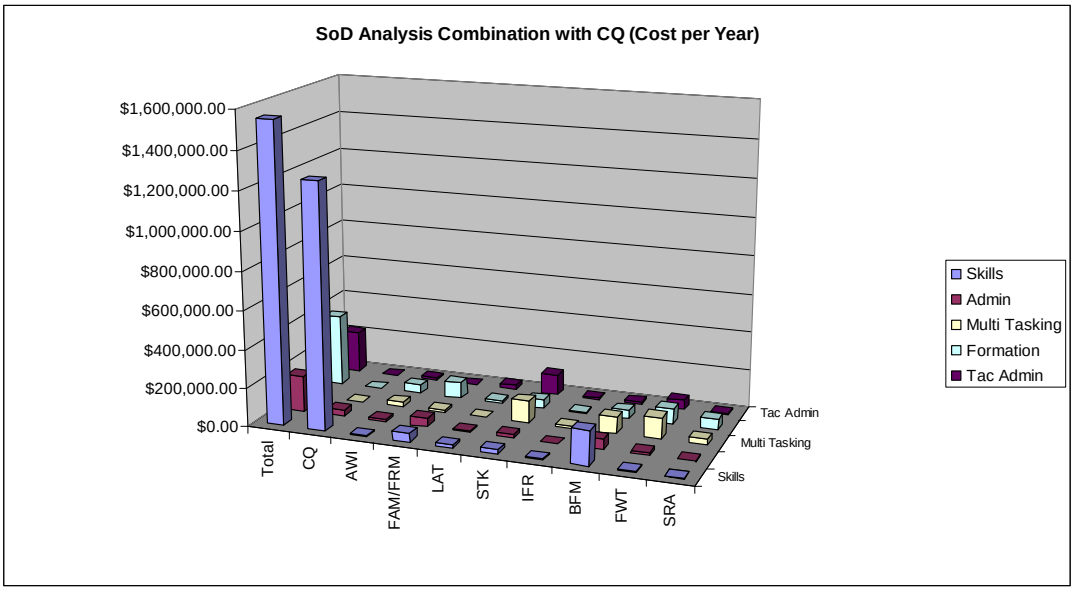
The SoD data was analyzed at two levels, the macro and the micro. The combined annual SoD Cause and SoD Cost charts of VFA-125, VFA-122 and VFA-106C/D were used at the macro level. This data was sorted both with and without CQ in order to better discern trends as CQ made all other SoDs relatively insignificant. Data was also sorted into FRS stages to rank dominant trends and provide more precise feedback to CNATRA Stage Managers.

At the micro level, SoDs were analyzed for consistent language to identify trends across all FRSs. This analysis produced the percentages found throughout the **Cause** paragraph above. It is certain that different analysts could and would find other interesting trends within the SoD data. The Squadron Reports in the appendix contain all SoDs.

[9] Cost figures were downloaded from http://www.defenselink.mil/comptroller/rates/index.html.

SoD Analysis Results

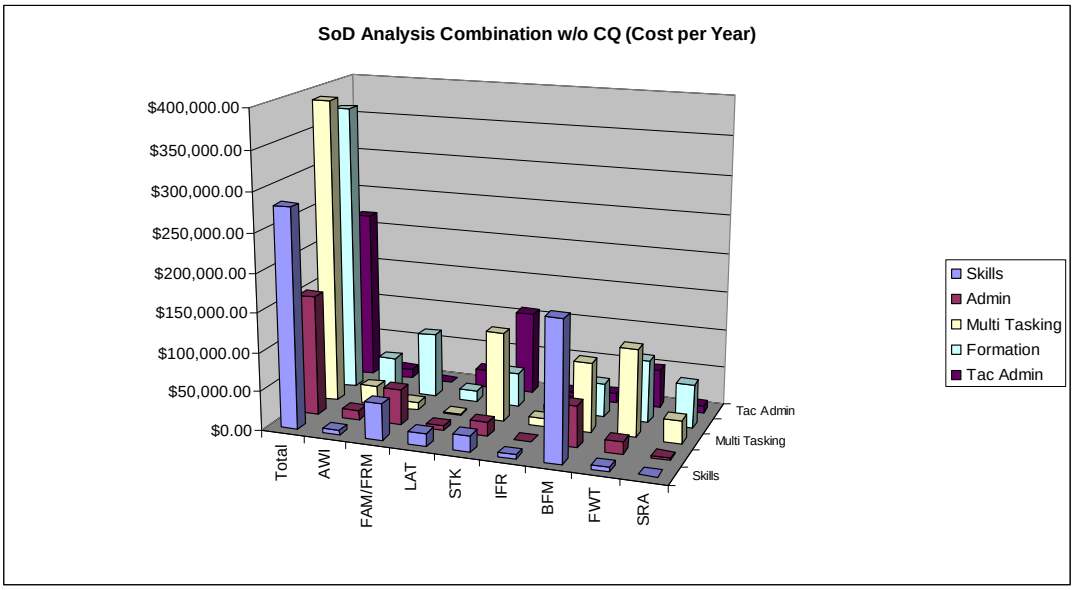
The annual SoD Cost chart below includes CQ and highlights the impact of FRS DQs. Re-flying FCLP and CQ periods drives 47.8% of the total annual SoD costs. Other skill errors push *Skill* up to 57% of the total. *Multi Tasking* (14.4%) and *Formation* (13.7%) were second and third. *Tac Admin* (8%) and *Admin* (6.9%) complete the causes' costs.



The spreadsheet below provides the dollar amounts.

SoD Analysis Combination with CQ (Cost per Year)						Totals
	Skills	Admin	Multi Tasking	Formation	Tac Admin	
Total	$1,547,494.53	$186,107.63	$391,259.30	$371,516.94	$218,983.01	$2,715,361.40
CQ	$1,266,365.07	$31,788.61	$0.00	$0.00	$0.00	$1,298,153.68
AWI	$5,908.27	$11,084.54	$24,497.10	$44,907.28	$11,466.33	$97,863.52
FAM/FRM	$47,357.20	$45,745.13	$10,350.82	$82,979.83	$0.00	$186,432.98
LAT	$16,542.16	$6,015.62	$1,127.73	$14,120.12	$23,068.27	$60,873.90
STK	$21,501.96	$18,387.56	$114,209.66	$44,211.77	$106,995.71	$305,306.67
IFR	$4,694.04	$607.12	$10,252.10	$5,238.71	$7,441.85	$28,233.81
BFM	$178,610.44	$53,952.66	$88,780.28	$43,830.60	$11,735.19	$376,909.17
FWT	$5,301.16	$16,097.93	$112,812.47	$80,375.25	$49,776.04	$264,362.84
SRA	$1,214.23	$2,428.46	$29,229.14	$55,853.38	$8,499.62	$97,224.83

The annual SoD Cost chart below does not include CQ and provides improved granularity into other SoD causes. *Multi Tasking* (27.6%), *Formation* (26.2%), and *Skills* (19.8%) are the top three expensive SoD causes. Yet again, *Tac Admin* (15.5%) and *Admin* (10.9%) are the least expensive types of errors.



The spreadsheet below provides the dollar amounts.

SoD Analysis Combination (Cost per Year)						Total
	Skills	Admin	Multi Tasking	Formation	Tac Admin	
Total	$281,129.45	$154,319.02	$391,259.30	$371,516.94	$218,983.01	$1,417,207.72
AWI	$5,908.27	$11,084.54	$24,497.10	$44,907.28	$11,466.33	$97,863.52
FAM/FRM	$47,357.20	$45,745.13	$10,350.82	$82,979.83	$0.00	$186,432.98
LAT	$16,542.16	$6,015.62	$1,127.73	$14,120.12	$23,068.27	$60,873.90
STK	$21,501.96	$18,387.56	$114,209.66	$44,211.77	$106,995.71	$305,306.67
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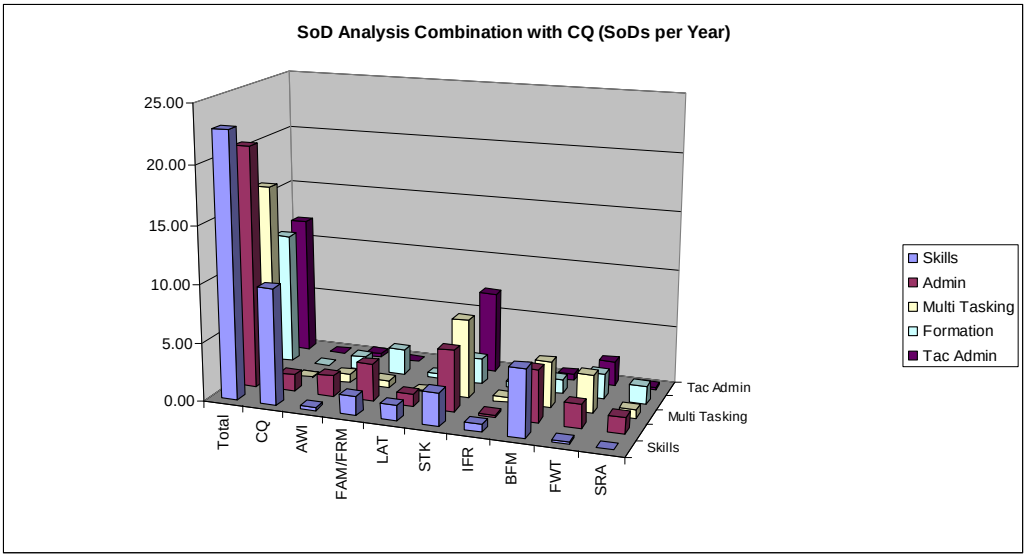
BFM	$178,610.44	$53,952.66	$88,780.28	$43,830.60	$11,735.19	$376,909.17
FWT	$5,301.16	$16,097.93	$112,812.47	$80,375.25	$49,776.04	$264,362.84
SRA	$1,214.23	$2,428.46	$29,229.14	$55,853.38	$8,499.62	$97,224.83

At this level of detail it is possible to see *Skill* errors dominating in BFM and *Tac Admin* errors impacting STK with *Multi Tasking* playing a similar percentage in both. There is a case to be made that TG TAC's ACM training may be lacking (remember *Skill* errors are in maneuvers taught first in TG TAC) yet our circle the wagon training appears adequate in WEPS (*Tac Admin* are largely things taught for the first time in the FRS)[10].

[10] One could also make the case that it is due to this author's belief that ACM is an art (requiring Skill) and dropping bombs is a science (requiring consistent Tac Admin habit patterns).

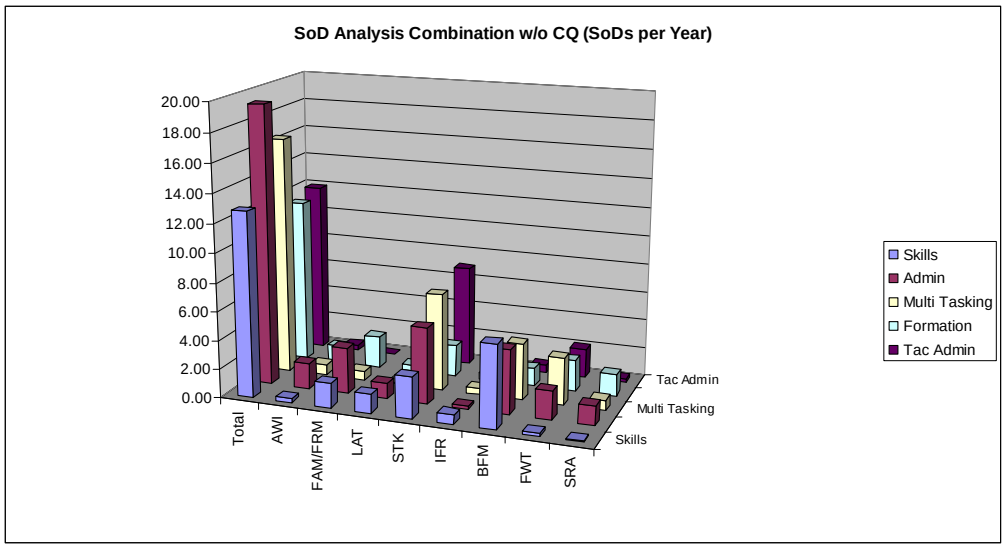
The annual SoD Cause chart below shows the most impactful errors to RAC grades in the FRS. The chart includes CQ errors. *Skills* (27.3% w/ CQ alone making up 12%), *Admin* (24.9%), and *Multi Tasking* (19.8%) are the top three SoD causes. *Tac Admin* (14.5%) and *Formation* (13.5%) impact RAC grades least.



The spreadsheet below provides the specifics.

SoD Analysis Combination with CQ (SoDs per Year)						Total
	Skills	Admin	Multi Tasking	Formation	Tac Admin	
Total	22.81	20.83	16.56	11.40	11.91	83.51
CQ	10.00	1.45	0.06	0.00	0.00	11.51
AWI	0.27	1.80	0.75	1.16	0.35	4.33
FAM/FRM	1.68	3.21	0.60	2.21	0.00	7.70
LAT	1.32	1.10	0.10	0.42	1.41	4.34
STK	2.87	5.26	6.72	2.22	6.99	24.06
IFR	0.65	0.19	0.44	0.50	0.35	2.13
BFM	5.76	4.45	3.93	1.25	0.52	15.91
FWT	0.21	2.00	3.26	2.15	2.05	9.67
SRA	0.06	1.37	0.70	1.49	0.23	3.86

The annual SoD Cause chart below shows the most impactful errors to RAC grades in the FRS. This chart does not include CQ errors. *Admin* (26.9%), *Multi Tasking* (22.9%), and *Skills* (17.8%) are the top three SoD causes. As before, *Tac Admin* (16.6%) and *Formation* (15.8%) impact RAC grades least.



The spreadsheet below provides the specifics.

SoD Analysis Combination (SoDs per Year)						Total
	Skills	Admin	Multi Tasking	Formation	Tac Admin	
Total	12.81	19.38	16.50	11.40	11.91	72.00
AWI	0.27	1.80	0.75	1.16	0.35	4.33
FAM/FRM	1.68	3.21	0.60	2.21	0.00	7.70
LAT	1.32	1.10	0.10	0.42	1.41	4.34
STK	2.87	5.26	6.72	2.22	6.99	24.06
IFR	0.65	0.19	0.44	0.50	0.35	2.13
BFM	5.76	4.45	3.93	1.25	0.52	15.91
FWT	0.21	2.00	3.26	2.15	2.05	9.67
SRA	0.06	1.37	0.70	1.49	0.23	3.86

The SoD Cause charts provide a different view of what causes SoDs. STK (29% of all SoDs occur in STK) and BFM (19%) are the dominate FRS stages. Upon consultation with FRS Training Officers it becomes apparent that new environments and multiple division flights make STK det a difficult time for the RAC. Exposure to detachment flying in the TRACOM is useful to mitigate these FRS difficulties.

Another issue apparent when looking at the charts is *Formation*, while expensive, does not affect grades very much. *Admin* is exactly the opposite ("SoD and Press"). When weighing which problem to attack it is important to remember that expensive SoDs are also time consuming ones due to ETs. The impact on Time to Train (TTT) should be considered when prioritizing changes to TG TAC to improve quality.

Finding the total annual SoD costs requires making the assumption that VMFAT-101 and VFA-106E/F annual SoDs cost were actually similar to the other Hornet FRSs, and then adding VAQ-129 SoD costs ($291,595 annually). This puts the annual costs at just under $5M. (The Squadron Reports in the appendix includes some figures on Hornet flight hours expended as

well.) This amount does not provide a compelling argument to spend additional money in TG TAC for the sole purpose of reducing FRS SoD costs. Change recommendations should be motivated by improvements to quality and/or reduction in TTT, not exclusively to fiscal savings.

Recommendations

In light of the percentage of TG TAC graduates that go on to Strike Fighters[11], TG TAC should conform to Hornet FRS Tactics, Training and Procedures (TTPs) to the maximum extent practicable. This will allow our graduates to spend less time in the FRS learning new administrative and Tac Admin procedures and more time on TTPs that simply cannot be simulated in a T-45A/C.

Recommend TG TAC maximize our airframes' potential to align with the Hornet FRSs. Clearly there are more opportunities to align the T-45C than the T-45A. In the past, a push to Standardization has led to FTIs and MCGs that teach to the lowest common denominator. While Standardization has been a key ingredient in the improvement of the Fleet and TG TAC, it is not an end in its own right. In the Fleet, Standardization's foremost purpose is to get the most out of the airframe. Legacy and Super Hornets prosecute air and ground targets somewhat differently as a result. Standardization for its own sake is wasteful of the T-45C potential, now a larger percentage of our inventory.

But the aircraft is less than half the battle. Truly aligning with the FRS will require aligning with the Fleet training program. And that begs the question, "What does an SFWT Level 0 (TG TAC graduate) need to know in order to go on to be a successful SFWT Level 1 (FRS graduate)?" Mapping the knowledge, skills and experience required from 'Street to Fleet' will be vital to placing any TG TAC syllabus changes in a larger context. Until that time, this report and the process it advocates will provide a low cost feedback loop that can improve quality.

For TG TAC Squadrons. Within the authorities available, use this report's data and analysis to provide command guidance to improve quality. Below are but two examples of how this could be done:

Issue: *Admin* – Specifically "Checklist" errors involved in 5.2% of all SoDs. Establish a blanket policy of awarding a Below Average (BA) for a set amount of missed checklist items.

Issue: *Multi Tasking* – Increase number of student leads from the working area. Goal is to change a low task loaded portion of the flight (return to base in cruise) into yet another multi-tasking evolution. While there would be some reduction in parade/cruise formation practice, *Multi Tasking* represents a far larger percentage of SoD cause and cost (22.9% and 14.4% respectively) than parade SoDs (<1%).

For TG TAC. Use this report's data and analysis to provide Standard Operating Procedures aligning TG TAC with Hornet TTPs, within the limits of the T-45 airframe.

[11] From CY03 through CY07 TG TAC has sent 73.6% of our graduates to Hornets, 14.6% to Harriers and 11.7% to Prowlers.

Additionally, TG TAC should provide quality-focused MCG and FTI change recommendations mirroring Hornet TTPs to CNATRA referencing this report. Examples below:

Issue: *Admin* - 7.5% of all SoDs involved either fuel or altitude warnings. SOP for BINGO and LAW usage needs to mirror Hornet Stan. Grading should zealously enforce those procedures.

Issue: *Multi Tasking and Tac Admin* – Close Air Support (CAS) procedures were involved in 16.5% of all STK stage SoDs. The SoDs were either "dropping without clearance" (*Multi Tasking*) or "system utilization / procedures" (*Tac Admin*). From the Fleet's perspective, CAS procedures have been used daily in the Global War on Terror (GWOT). The introduction of conditional weapons release authority ("Cleared Hot") to circle the wagon WEPS sorties, and the addition of low-threat talk on CAS procedures could be demonstrative of TG TAC responding to the Fleet's emergent needs.

For CNATRA. Just as what is truly "UNSATISFACTORY" is subjective, the actual cause of the SoD (*Skill, Admin*, etc.) is somewhat subjective. Additionally, the variation in reporting quality among the various FRSs makes the generation of a truly all-inclusive look at SoDs impossible at this time. However, the breadth and consistency of this analysis moves FRS feedback far beyond urban legend and informal conference sidebars. It is a rich source of suggestions for improvements to TG TAC and it should be continued.

Addressing the data shortcomings requires CNATRA assistance and direction to the FRSs. Recommend CNATRA, in conjunction with the Human Performance Center and the applicable FRSs, coordinate the development of a standardized SoD Incident Form. Ideally the form would include a manageable list of proximate SoD causes to be selected by the FRS IP and flight/simulator hours for any ET awarded (see example below). This information, readily available at the source, would remove TRACOM interpretation of the data and allow for simplified compilation and improved timeliness. Further recommend CNATRA distribute this 'SoD Report' to TG TAC on six month intervals allowing Wing level action on FRS feedback. Over time these reports will identify trends and, hopefully, document improvements to TG TAC graduates.

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SIGNAL OF DIFFICULTIES FORM
STRIKE FIGHTER SQUADRON XXX

NAME:_____EVENT_____
SSN:_____DATE_____

DESCRIPTION OF DIFFICULTY (ATTACH GRADESHEET):

_____
_____
_____
_____
_____
_____
_____

Check all that apply SPECIFICALLY TO THE SoD:

- ❑ *Skills*
  - ❑ *Basic Airwork*
  - ❑ *Advanced Airwork (Ditch, etc)*
  - ❑ *Poor Hits, Poor Mechanics*
  - ❑ *Etc*
- ❑ *Admin*
  - ❑ *Preflight Prep*
  - ❑ *Headwork*
  - ❑ *Checklists*
  - ❑ *Course Rules*
  - ❑ *Etc*
- ❑ *Formation*
  - ❑ *Parade*
  - ❑ *TACFORM*
  - ❑ *Rendezvous*
  - ❑ *Mutual Support*
  - ❑ *Etc*
- ❑ *Multi Tasking*
  - ❑ *Task Saturated*
  - ❑ *Deck Busts*
  - ❑ *Low Pulls*
  - ❑ *Drop w/o Clrnc, Wrong Tgt*
  - ❑ *Etc*
- ❑ *Tac Admin*
  - ❑ *A/G, A/A, LATT Checklists*
  - ❑ *System Utilization*
  - ❑ *Radar Mechanics*
  - ❑ *Notch Mechanics*
  - ❑ *Etc*

INSTRUCTOR RECOMMENDATIONS:

_____
_____

INSTRUCTOR:_____/S/_____

STUDENT ACKNOWLEDGMENT:

I_____ACKNOWLEDGE REVIEWING THIS SOD AND UNDERSTAND THAT I WILL NOT FLY IN AN AIRCRAFT OR SIMULATOR UNTIL A REMEDIAL PROGRAM HAS BEEN APPROVED BY THE COMMANDING OFFICER. I AM ALLOWED TO ATTEND LECTURES AND CAI'S WHILE AWAITING REMEDIAL TRAINING. AFTER REVIEWING THIS SOD, I AM DIRECTED TO REPORT TO THE TRAINING OFFICER FOR FURTHER GUIDANCE.
STUDENT SIGNATURE:_____

ROUTING
1. TRAINING OFFICER: /S/_____DATE/TIME_____/_____
2. OPERATIONS OFFICER: /S/_____DATE/TIME_____/_____
3. EXECUTIVE OFFICER: /S/_____DATE/TIME_____/_____
4. COMMANDING OFFICER:/S/_____DATE/TIME_____/_____

SIGNAL OF DIFFICULTIES FORM PART II

TRAINING OFFICER'S RECOMMENDATION:

_____
_____
_____
_____

OPERATIONS OFFICER'S RECOMMENDATION:

_____
_____
_____
_____

COMMANDING OFFICER'S ACTION:

_____
_____
_____
_____

BACK ROUTE	**INITIALS/DATE**
1. TRAINING OFFICER	_____/_____
2. OPERATIONS/SCHEDULES	_____/_____
3. TRAINING RECORDS/FILE	_____/_____

TOTAL RAC FLIGHT TIME FOR ET / REFLIES: _____

TOTAL SUPPORT FLIGHT TIME FOR ET/ REFLIES (LEADS, BANDITS) _____

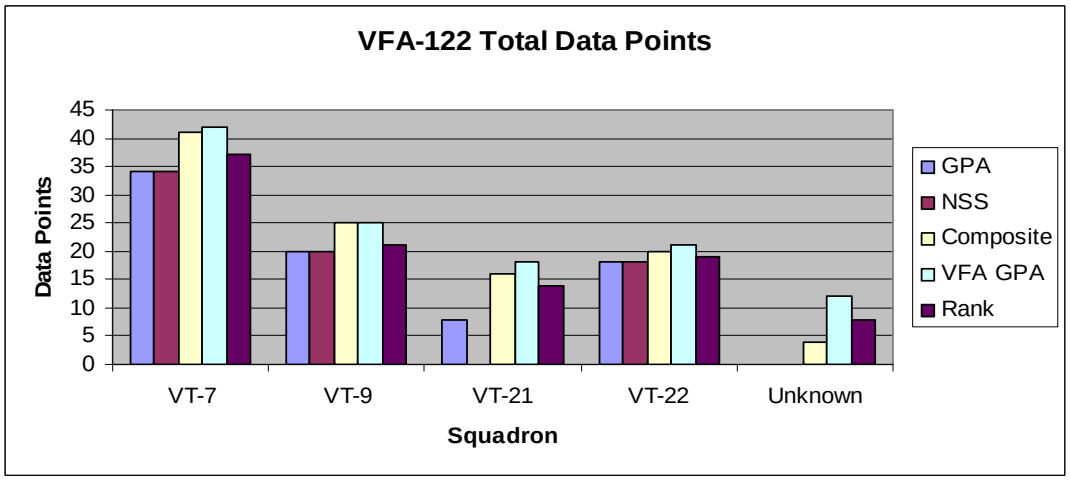
ADDITIONAL TIME TO TRAIN _____

4. CNATRA N7 _____/_____

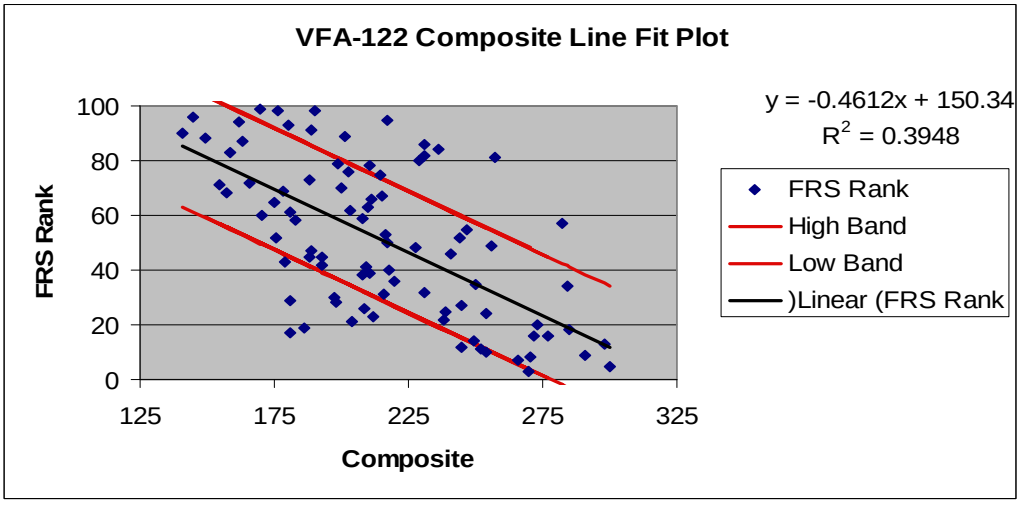
VFA-122

Squadron Report

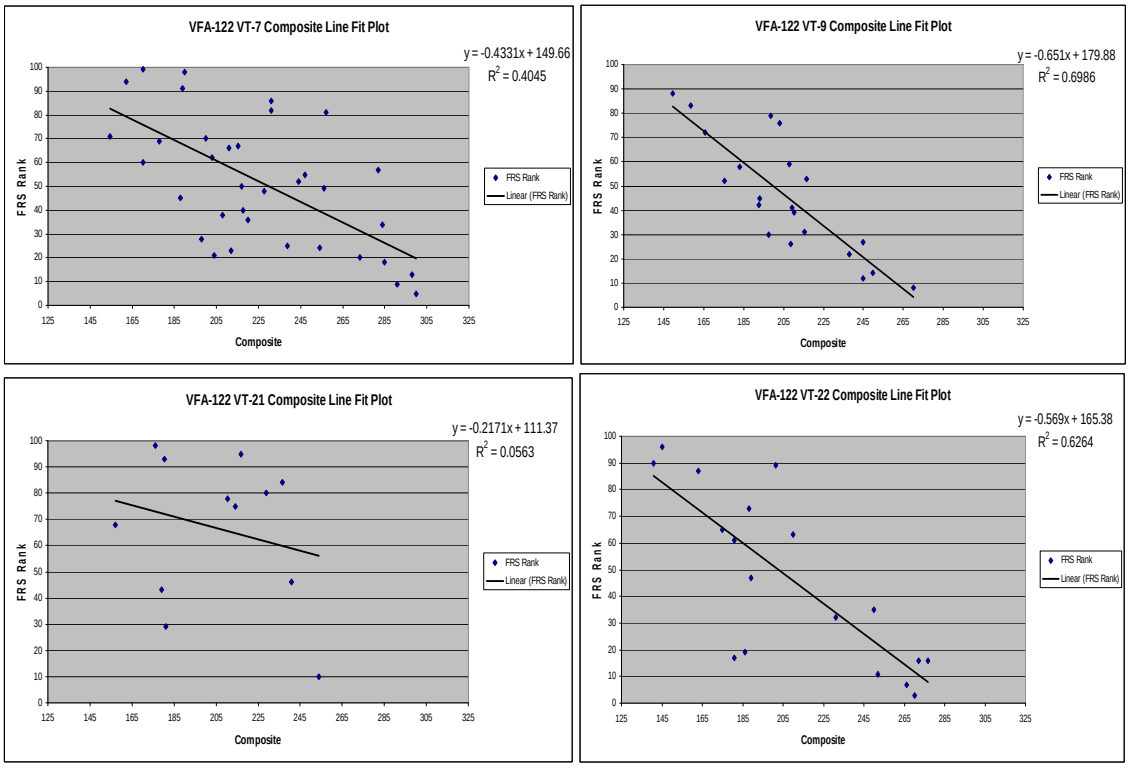
Grade Data. Data was gathered from 118 students from VFA-122. 87 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.



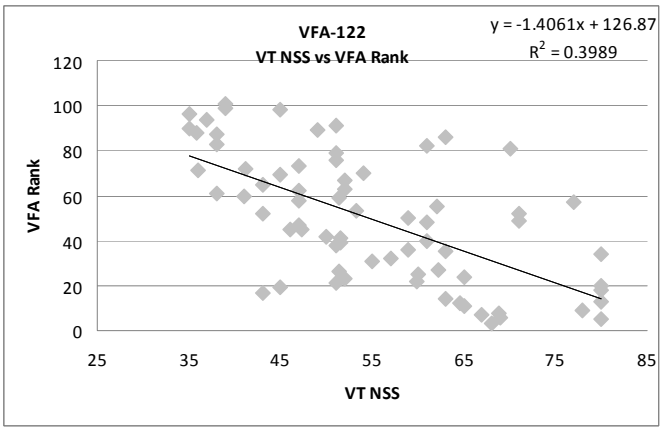
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator.



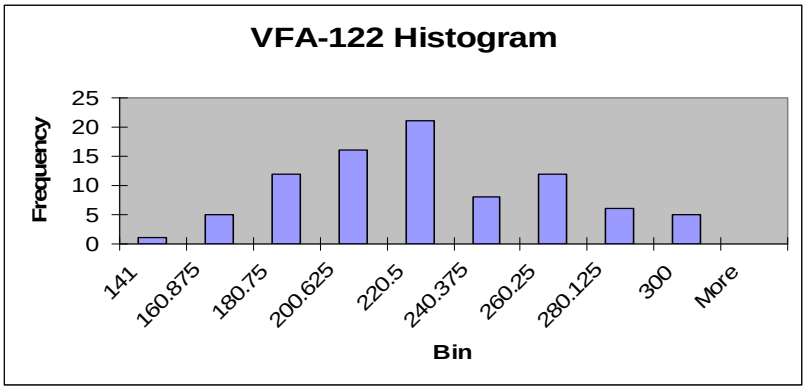
Below are the linear regressions for VFA-122 broken down by VT squadrons.



In the first portion of the grade analysis the author tried to use the VT NSS score compared to the VFA Rank. This proved to be inferior to the composite score ranking system because the NSS scores yielded similar if not worse (VFA-125) overall results with significantly less availability then the composite scores.



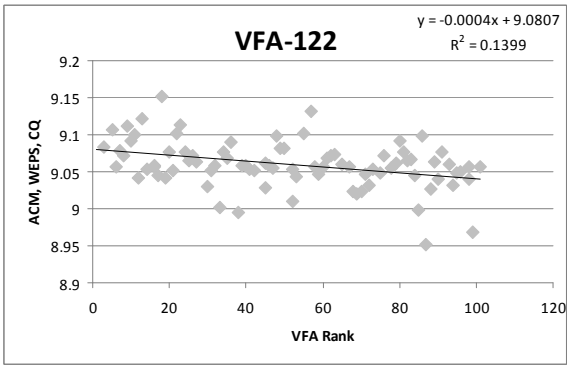
A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VFA-122 had a relatively standard quality spread, resembling a bell curve.



Dead Ends

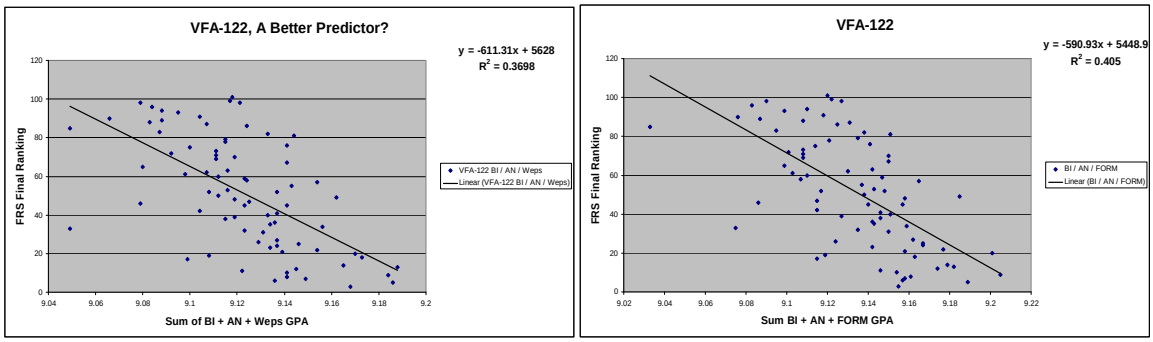
Data collection and analysis was conducted in two phases. In Phase 1, VFA-122 and VFA-125 were studied in great depth. This Phase focused on discovering what data was important and what analysis produced the best information. These efforts were not always successful, which is to be expected. While there were dozens of small detours enroute to the final report, there were four significant 'dead ends' that deserve mention in the Squadron Reports.

A Better Performance Predictor? The goal here was to find a number derived from the student's grades which predicted their performance in the FRS better than composite score. The first attempt was to look at the stages most like the FRSs: ACM, WEPs and CQ. Adding these three GPAs together and then comparing them to FRS ranking yielded the results below:



It is possible that a stage NSS, vice GPA, would have yielded better results, but very few of the *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms included individual stage NSSs.

We next ran a linear regression of each VT stage grade against FRS final ranking and found BI, AN and FORM were the top three. Adding these grades together and comparing them to FRS ranking yielded the following results (WEPs was a close 4th, so we looked at that as well):



While this is slightly better than straight Composite score, it required far more effort to get the data and was found to be unworthy of the effort.

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-9 sent their 'A-Team' to VFA-122 and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-9 was better than the rest? Or was it just because VT-9 had 'gamed' the system for the best FRS ranking?

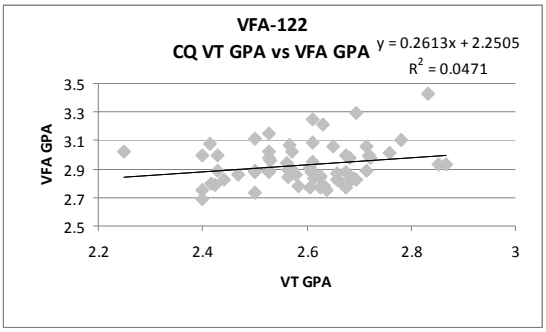
The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-7 sent the highest average composite score to VFA-122. If the linear regression we ran on the VFA-122 population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 46.8 upon FRS completion. Their average graduate actually ranked 52.4, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of -5.6. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VFA-122 are below.

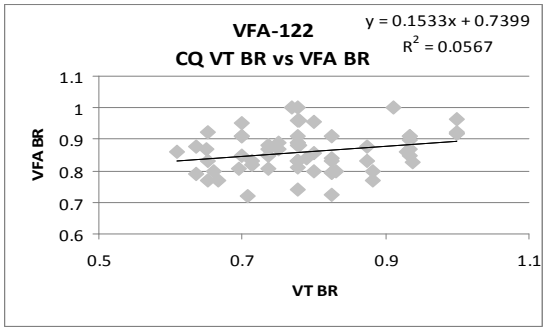
VFA 122							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	3.041	58.941	224.528	3.015	52.417	46.795	-5.622
VT-9	3.036	51.865	206.310	3.018	45.571	55.197	9.625
VT-21	3.031	NA	206.282	3.010	66.583	55.210	-11.374
VT-22	3.032	49.500	209.901	3.018	45.944	53.540	7.596
VFA 122	3.035	53.435	211.755	3.015	52.629	52.686	0.057

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found

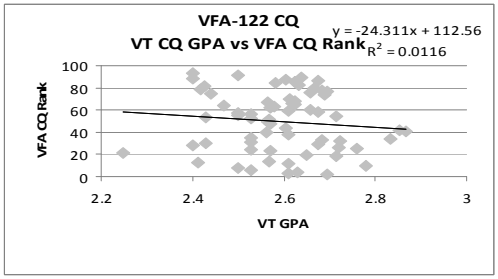
were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end.

Carrier Qualification. Phase 1 work on VFA-122 CQ resulted in 68 complete data points. Complete data points had VT CQ GPA (grades at the ship, not CQ Stage GPA), VT Boarding Rate (BR), FRS CQ GPA, and FRS BR.

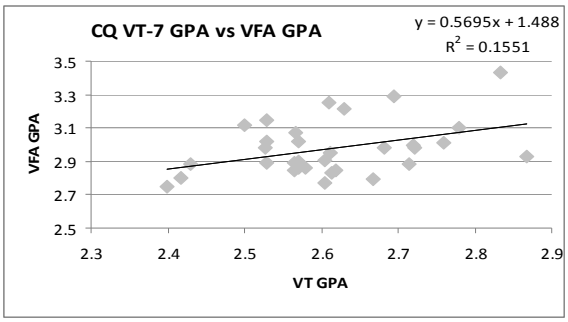


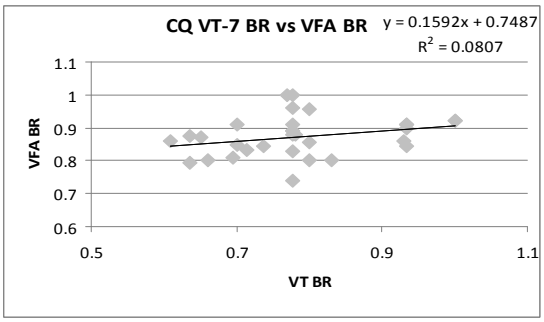


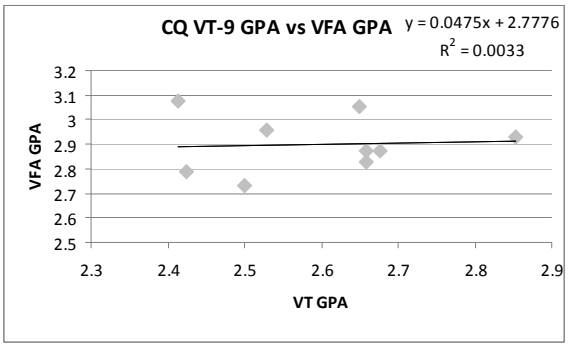
The tight grouping of data around 3.0 hurt overall correlation. An attempt was made to "draw out" the FRS CQ grades by ranking these from first to last. Unfortunately, r^2 was not improved.

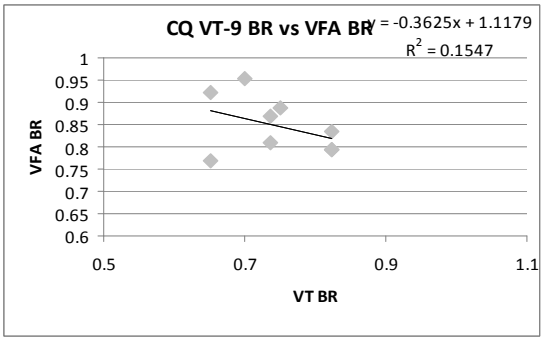


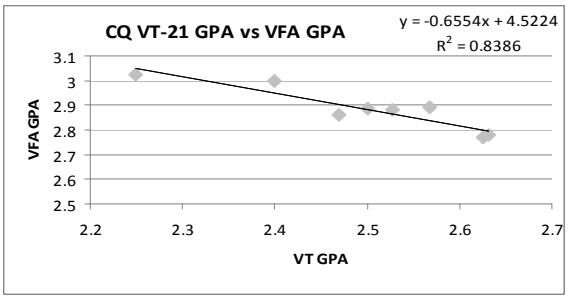
Individual VT Squadron data is graphed below.

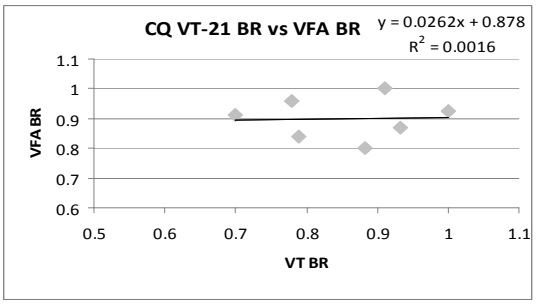


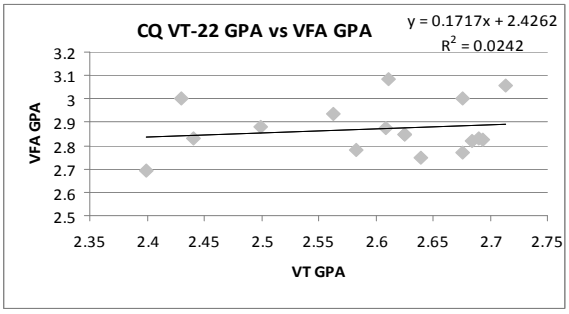


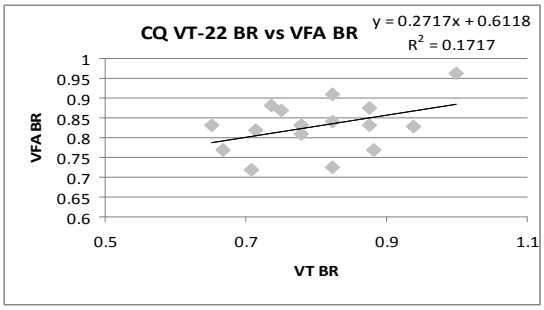












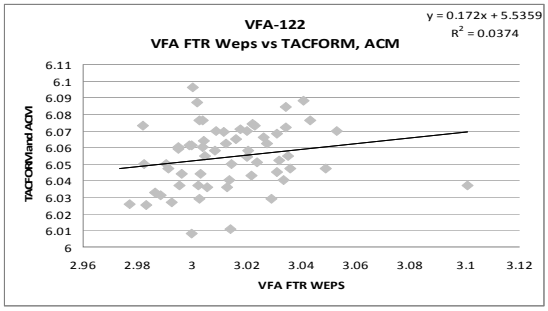
There was low correlation (r^2<.05) between VT grades and FRS performance regardless of how the data was sorted. Having said that, VT-7's graduates were the most successful in Lemoore CQ.

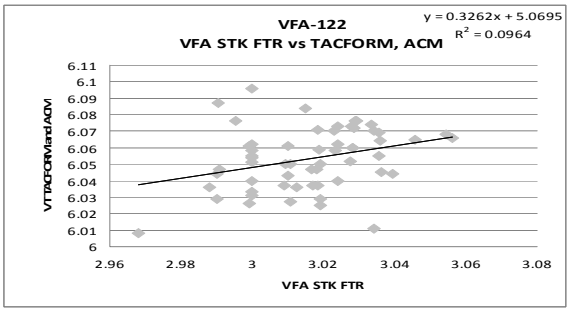
VFA-122									
	VT		VFA						
Squadron	GPA	BR	GPA	BR	Day GPA	Day BR	Nt GPA	Nt BR	CQ Rank
VT-7	2.612	78.7%	2.969	88.4%	2.987	91.1%	2.956	86.1%	41.1
VT-9	2.596	74.4%	2.912	85.9%	2.957	89.9%	2.863	80.7%	49.2
VT-21	2.506	84.8%	2.819	88.3%	2.820	89.7%	2.919	88.2%	51.9
VT-22	2.595	79.7%	2.898	83.4%	2.891	84.1%	2.909	84.5%	55.3
VFA-122	2.591	79.1%	2.918	86.8%	2.934	89.2%	2.920	84.9%	49.4
STD DEV	0.115911681	0.099446168	0.20042	0.072684525	0.214468652	8.9%	0.19228	0.11443	

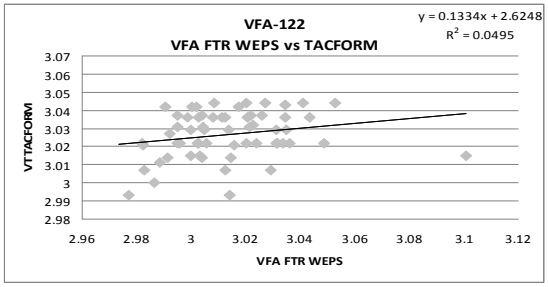
88 Rank Data Points
68 Complete Data Points

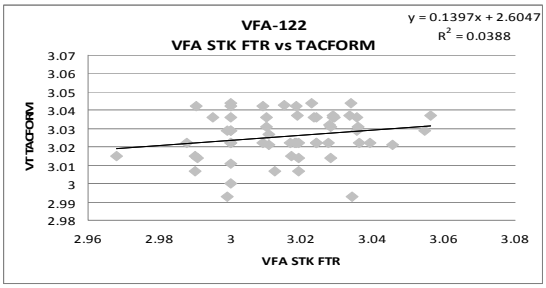
Further investigation of CQ grades was abandoned in Phase 2 due to the low correlation between VT grades and FRS performance in CQ.

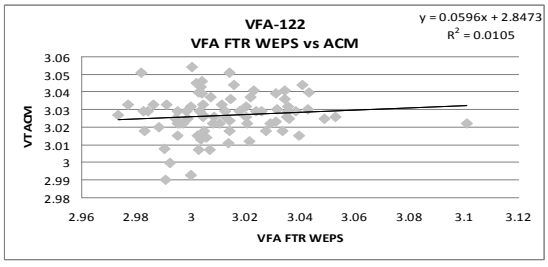
Fighter Weapons. An attempt to identify a "Center of Excellence" for the Air to Air mission lead us to compare ACM, TAC FORM, Fighter Weps and Strike Fighter syllabi. Yet again we had limited success predicting FRS performance using VT stage grades.

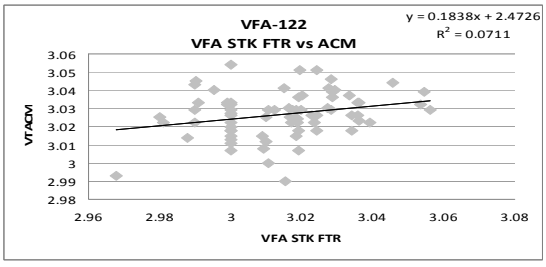












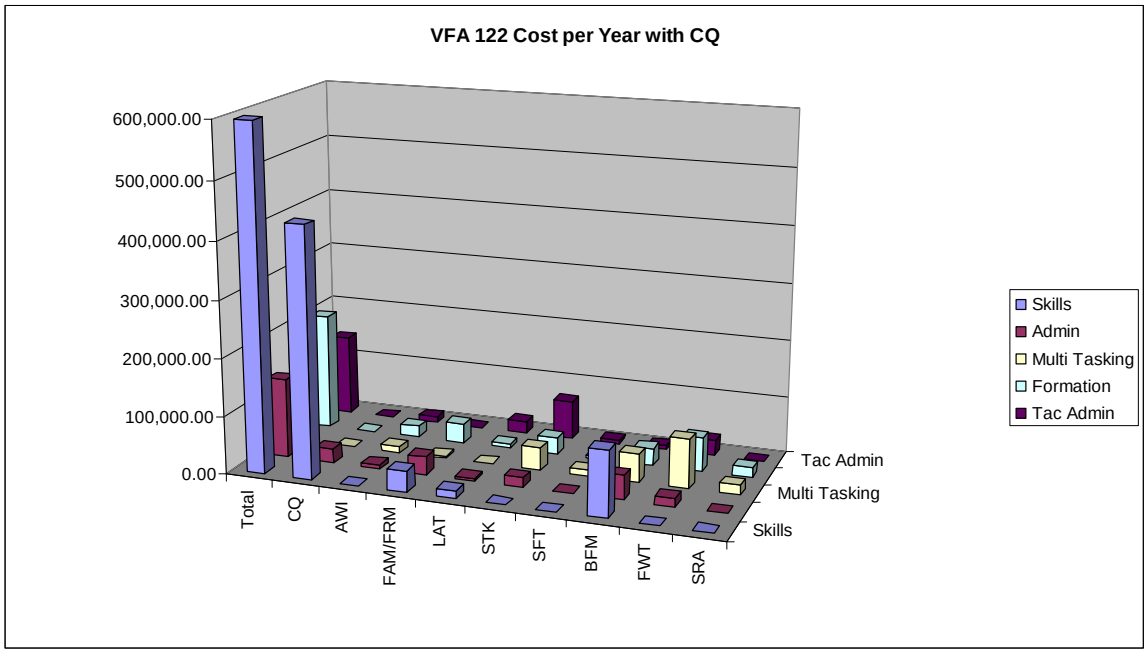
That having been said, VT-22 graduates performed well in the Air-to-Air arena.

VFA-122				
	TACFORM	ACM	FTR WEPS	STK FTR
VT-7	3.032882353	3.0289744	3.013742857	3.014168
VT-9	3.027	3.01984	3.014171429	3.01358
VT-21	3.031375	3.02625	3.004592857	3.00960769
VT-22	3.024444444	3.0322857	3.015105556	3.01848824
VFA-122	3.0293625	3.0269703	3.01334186	3.0144026
STD DEV	0.013578878	0.01159	0.020594827	0.01781348

This thought may not have run its course. It is possible that using VT Stage NSSs, vice GPAs, could improve correlation. Future data collection should further explore the idea.

SoD Analysis

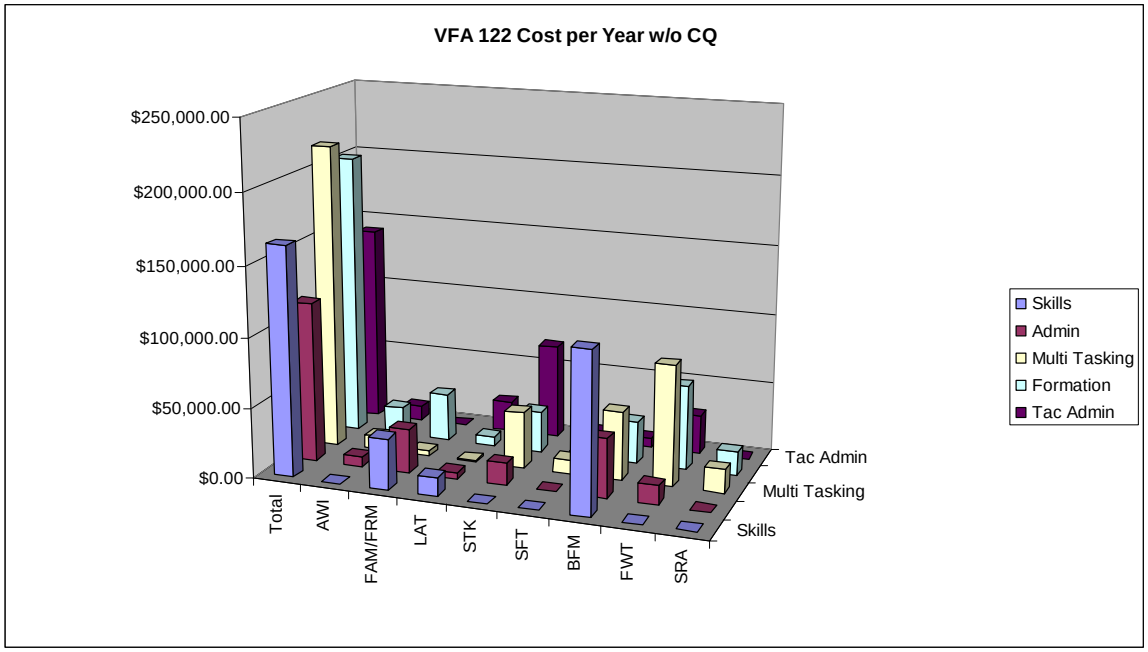
VFA-122 had 139 total SoDs that were analyzed in the report. The analysis was run both with and without the carrier qualification data due to the fact that a failure at the boat or at the FCLP resulted in an additional 20 flights and an overshadowing cost in the *Skills* category. The analysis was also run with and without F-5 aircraft being accounted for. Re-flying FCLP and CQ periods drives 35.24% of the total annual SoD costs. Other skill errors push *Skills* up to 46.05% of the total. *Multi Tasking* (16.8%) and *Formation* (15.62%) were second and third. *Tac Admin* (10.88%) and *Admin* (10.65%) complete the causes' costs.



The spreadsheet below provides the dollar amounts.

VFA 122 Cost per Reason With CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Cost
Total	$597,777.03	$138,209.67	$218,130.46	$202,786.49	$141,239.73	$1,298,143.38	100.00%
CQ	$433,777.64	$23,693.74	$0.00	$0.00	$0.00	$457,471.38	35.24%
AWI	$0.00	$6,834.73	$10,252.10	$20,504.20	$10,252.10	$47,843.12	3.69%
FAM/FRM	$36,429.12	$31,337.24	$3,998.32	$34,173.66	$0.00	$105,938.34	8.16%
LAT	$13,669.46	$4,579.27	$1,127.73	$6,834.73	$21,631.93	$47,843.12	3.69%
STK	$0.00	$15,959.10	$40,427.44	$29,628.56	$67,766.36	$153,781.46	11.85%
SFT	$0.00	$0.00	$10,252.10	$3,417.37	$6,834.73	$20,504.20	1.58%
BFM	$113,900.80	$42,136.12	$49,005.03	$30,756.29	$6,834.73	$242,632.98	18.69%
FWT	$0.00	$13,669.46	$85,980.92	$60,384.85	$27,919.88	$187,955.12	14.48%
SRA	$0.00	$0.00	$17,086.83	$17,086.83	$0.00	$34,173.66	2.63%
%Cost	46.05%	10.65%	16.80%	15.62%	10.88%	100.00%	

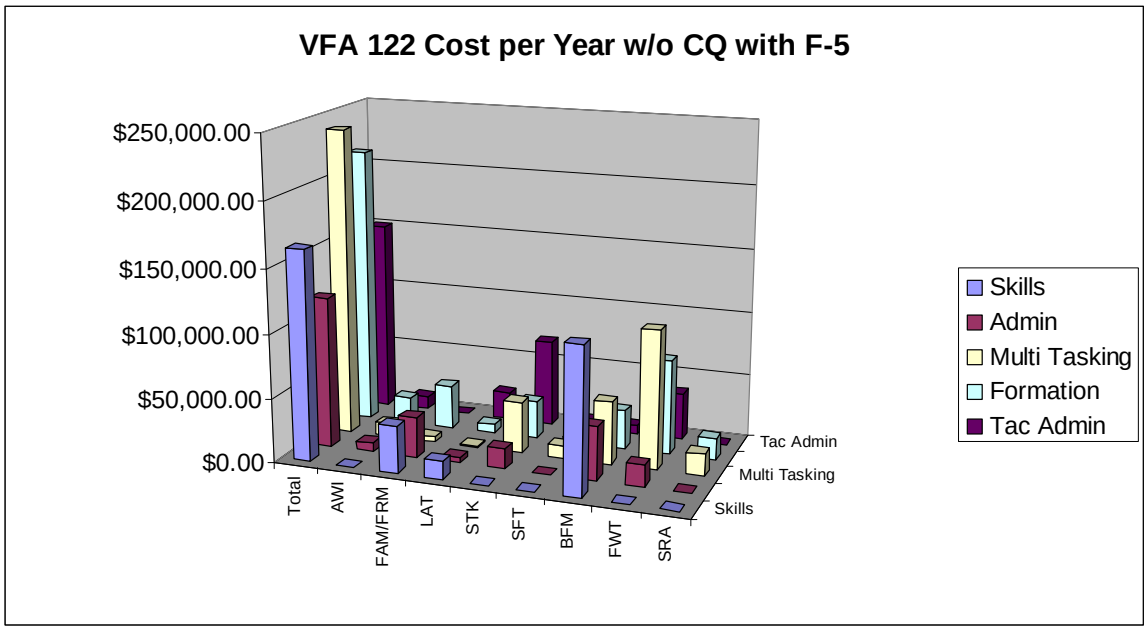
The annual SoD Cost chart below does not include CQ and provides improved granularity into other SoD causes. *Multi Tasking* (25.95%), *Formation* (24.12%), and *Skills* (19.51%) are the top three expensive SoD causes. Yet again, *Tac Admin* (16.8%) and *Admin* (13.62%) are the least expensive types of errors.



The spreadsheet below provides the dollar amounts.

VFA 122 Cost per year w/o CQ (no F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%cost**
Total	$163,999.39	$114,515.93	$218,130.46	$202,786.49	$141,239.73	$840,672.00	100.00%
AWI	$0.00	$6,834.73	$10,252.10	$20,504.20	$10,252.10	$47,843.12	5.69%
FAM/FRM	$36,429.12	$31,337.24	$3,998.32	$34,173.66	$0.00	$105,938.34	12.60%
LAT	$13,669.46	$4,579.27	$1,127.73	$6,834.73	$21,631.93	$47,843.12	5.69%
STK	$0.00	$15,959.10	$40,427.44	$29,628.56	$67,766.36	$153,781.46	18.29%
SFT	$0.00	$0.00	$10,252.10	$3,417.37	$6,834.73	$20,504.20	2.44%
BFM	$113,900.80	$42,136.12	$49,005.03	$30,756.29	$6,834.73	$242,632.98	28.86%
FWT	$0.00	$13,669.46	$85,980.92	$60,384.85	$27,919.88	$187,955.12	22.36%
SRA	$0.00	$0.00	$17,086.83	$17,086.83	$0.00	$34,173.66	4.07%
%Cost	19.51%	13.62%	25.95%	24.12%	16.80%	100.00%	

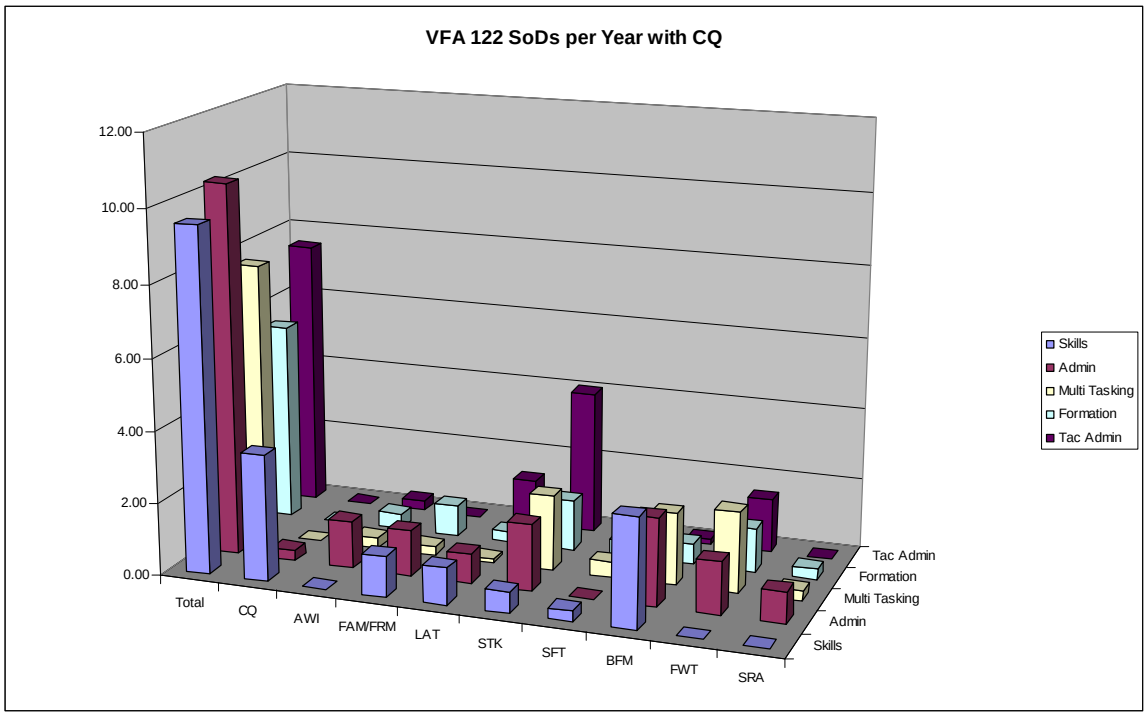
Lastly the analysis was run without the CQ data, but with the F-5 costs included. *Multi Tasking* (27.01%), *Formation* (24.37%), and *Skills* (18.44%) are the top three expensive SoD causes. Yet again, *Tac Admin* (16.92%) and *Admin* (13.26%) are the least expensive types of errors. The overall cost increased $48,795.89 and the percent change was an increase of 5.49%.



The spreadsheet below provides the dollar amounts.

VFA 122 Cost per Year w/o CQ with F-5							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Cost**
Total	$163,999.39	$117,940.20	$240,251.27	$216,766.08	$150,510.95	$889,467.89	100.00%
AWI	$0.00	$6,834.73	$10,252.10	$20,504.20	$10,252.10	$47,843.12	5.38%
FAM/FRM	$36,429.12	$31,337.24	$3,998.32	$34,173.66	$0.00	$105,938.34	11.91%
LAT	$13,669.46	$4,579.27	$1,127.73	$6,834.73	$21,631.93	$47,843.12	5.38%
STK	$0.00	$15,959.10	$40,427.44	$29,628.56	$67,766.36	$153,781.46	17.29%
SFT	$0.00	$0.00	$10,252.10	$3,417.37	$6,834.73	$20,504.20	2.31%
BFM	$113,900.80	$42,136.12	$49,005.03	$30,756.29	$6,834.73	$242,632.98	27.28%
FWT	$0.00	$17,093.74	$108,101.73	$74,364.45	$37,191.10	$236,751.01	26.62%
SRA	$0.00	$0.00	$17,086.83	$17,086.83	$0.00	$34,173.66	3.84%
%Cost	18.44%	13.26%	27.01%	24.37%	16.92%	100.00%	

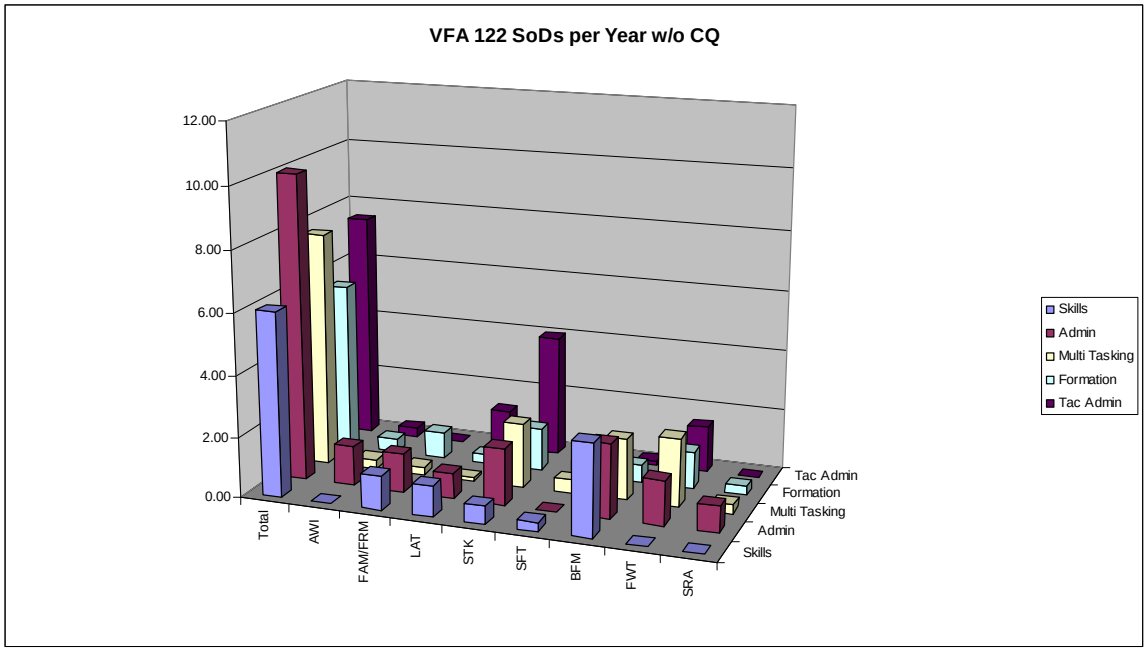
The annual SoD Cause chart below shows the most impactful errors to RAC grades in VFA-122. The chart includes CQ errors. *Admin* (25.41%), *Skills* (23.5% w/ CQ alone making up 9.35%), and *Multi Tasking* (18.96%) are the top three SoD causes. This is a slight departure from the Overall SoD Cause chart, because typically *Skills* is the leading cause followed by *Admin*, then *Multi Tasking*. *Tac Admin* (18.47%) and *Formation* (13.67%) impact RAC grades least.



The spreadsheet below provides the specifics.

VFA 122 SoDs per Year with CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Total
Total	9.56	10.34	7.71	5.56	7.51	40.68	100.00%
CQ	3.5122	0.292682927	0	0	0	3.80	9.35%
AWI	0.00	1.32	0.29	0.44	0.29	2.34	5.76%
FAM/FRM	1.12	1.27	0.25	0.88	0.00	3.51	8.63%
LAT	1.02	0.83	0.10	0.29	1.27	3.51	8.63%
STK	0.59	1.85	2.10	1.41	4.00	9.95	24.46%
SFT	0.29	0.00	0.44	0.44	0.29	1.46	3.60%
BFM	3.02	2.44	2.00	0.59	0.15	8.20	20.14%
FWT	0.00	1.46	2.24	1.22	1.51	6.44	15.83%
SRA	0.00	0.88	0.29	0.29	0.00	1.46	3.60%
%Total	23.50%	25.41%	18.96%	13.67%	18.47%	100.00%	

The annual SoD Cause chart below shows the most impactful errors to RAC grades in VFA-122. This chart does not include CQ errors. *Admin* (27.24%), *Multi Tasking* (20.91%), and *Tac Admin* (20.37%) are the top three SoD causes. *Skills* (16.4%) and *Formation* (15.08%) impact RAC grades least. This is slightly different then the Overall annual SoD Cause chart because typically *Skills* is the third highest error followed by *Tac Admin*.



The spreadsheet below provides the specifics.

VFA 122 SoDs per Year w/o CQ (no F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Total**
Total	6.05	10.04	7.71	5.56	7.51	36.88	100.00%
AWI	0.00	1.32	0.29	0.44	0.29	2.34	6.35%
FAM/FRM	1.12	1.27	0.25	0.88	0.00	3.51	9.52%
LAT	1.02	0.83	0.10	0.29	1.27	3.51	9.52%
STK	0.59	1.85	2.10	1.41	4.00	9.95	26.98%
SFT	0.29	0.00	0.44	0.44	0.29	1.46	3.97%
BFM	3.02	2.44	2.00	0.59	0.15	8.20	22.22%
FWT	0.00	1.46	2.24	1.22	1.51	6.44	17.46%
SRA	0.00	0.88	0.29	0.29	0.00	1.46	3.97%
%Total	16.40%	27.24%	20.91%	15.08%	20.37%	100.00%	

Below is the summary of VFA-122 flights required post SoD and overall cost with and without CQ.

	VFA-122 Flights Required post-SoD		
	Total F/A-18	TOTAL F-5	TOTAL T-34
AWI	14	0	0
FAM/FRM	31	0	0
LAT	14	0	0
STK	45	0	4
SFT	6	0	0
BFM	71	0	0
FWT	55	57	0
SRA	10	0	0
CQ	251	0	0
Total	497	57	4
Aircraft Required per Year	145.46	16.68	1.17
Total Flight Hours	745.50	62.70	4.40
Annual Flight Hours	218.20	18.35	1.29

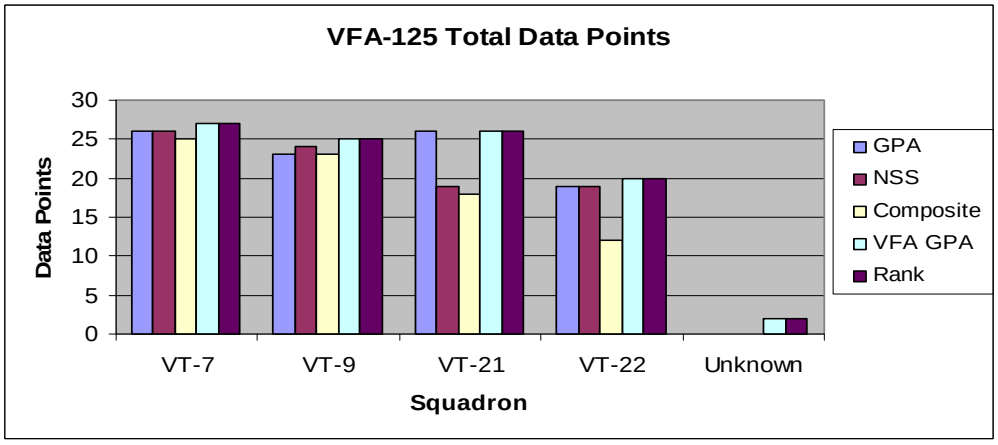
VFA-122 Data from MAY 2004 to SEP 2007 With CQ and F-5	
Total Months	41
# QRT	13.67
# Years	3.42
Total Cost	$4,602,042.50
Cost / Year	$1,346,939.27
Cost/ QRT	$98,556.53

VFA-122 Data from MAY 2004 to SEP 2007 w/o CQ and w/F-5	
Total Months	41
# QRT	13.67
# Years	3.42
Total Cost	$3,039,015.30
Cost / Year	$889,467.89
Cost/ QRT	$65,083.02

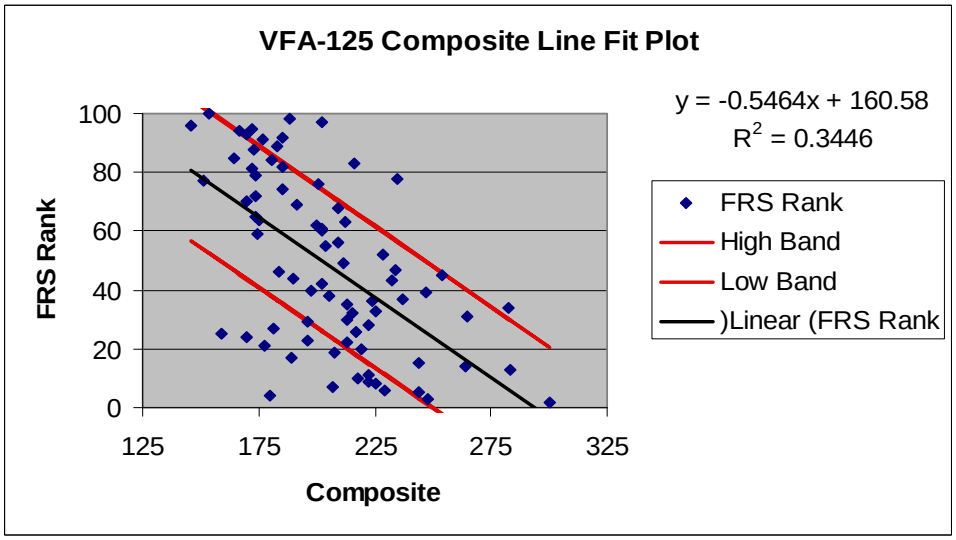
VFA-125

Squadron Report

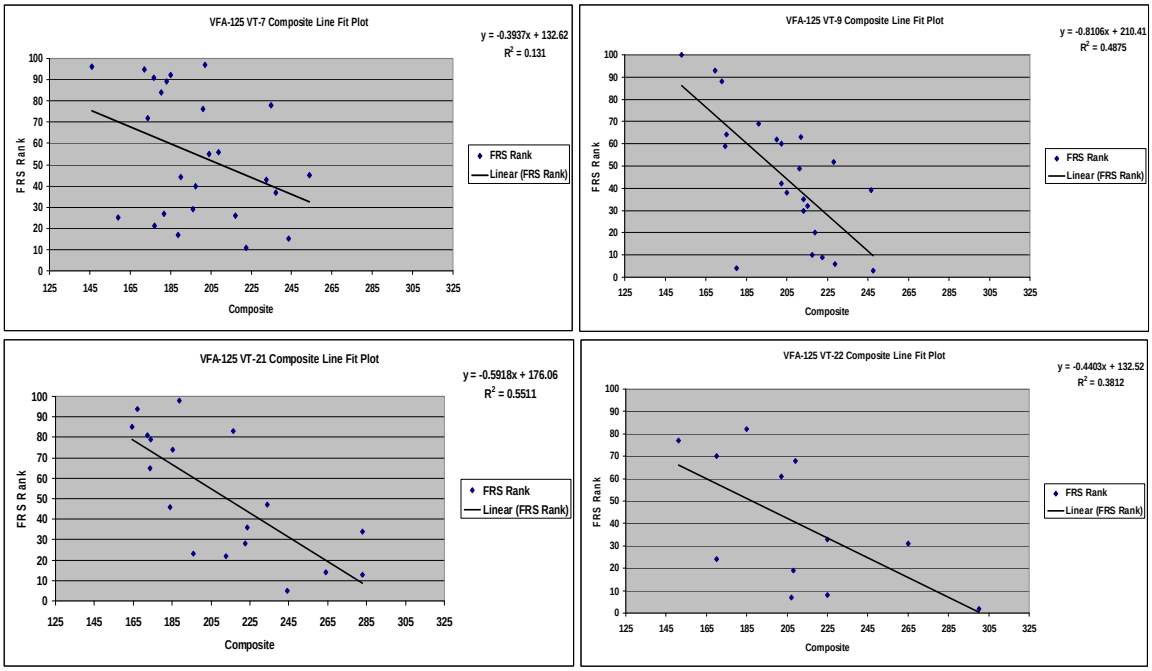
Grade Data. Data was gathered from 100 students from VFA-125. 78 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.



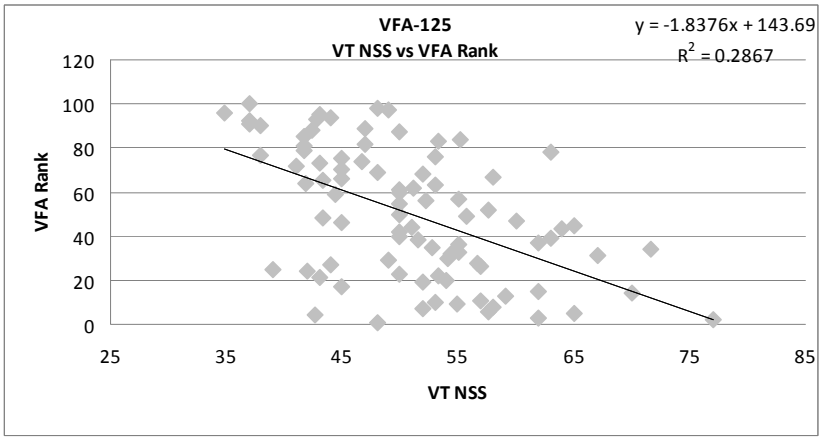
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator.



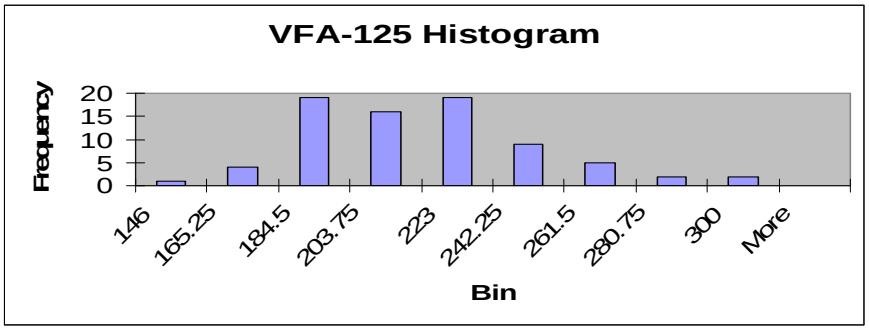
Below are the linear regressions for VFA-125 broken down by VT squadrons.



In the first portion of the grade analysis the author tried to use the VT NSS score compared to the VFA Rank. This proved to be inferior to the composite score ranking system because the NSS scores yielded worse overall results with significantly less availability then the composite scores.



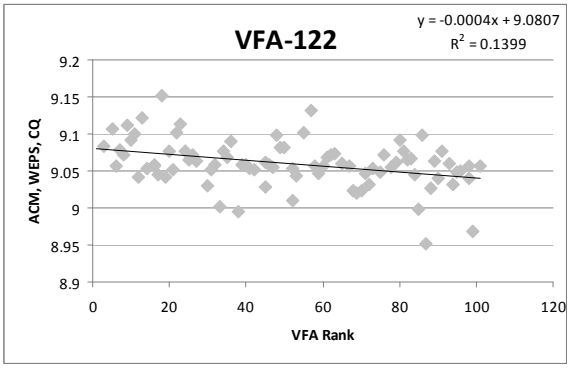
A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VFA-125 had a relatively standard quality spread, resembling a bell curve that was weighted slightly heavy in the middle.



Dead Ends

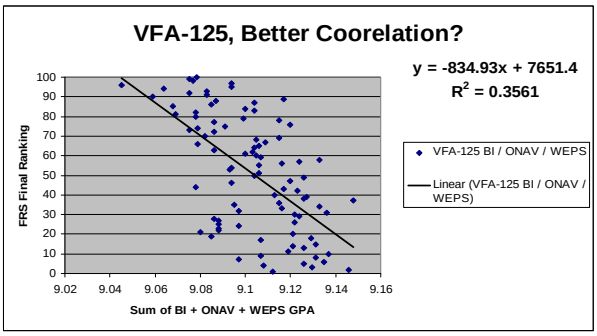
Data collection and analysis was conducted in two phases. In Phase 1, VFA-122 and VFA-125 were studied in great depth. This Phase focused on discovering what data was important and what analysis produced the best information. These efforts were not always successful, which is to be expected. While there were dozens of small detours enroute to the final report, there were four significant 'dead ends' that deserve mention in the Squadron Reports.

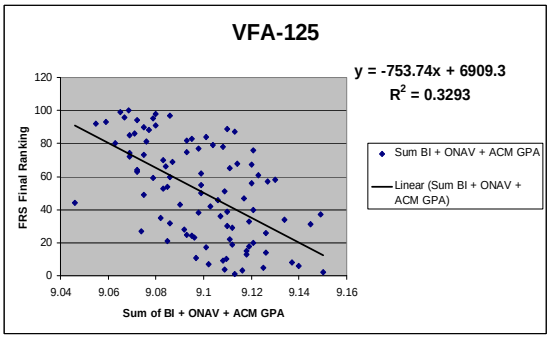
A Better Performance Predictor? The goal here was to find a number derived from the student's grades which predicted their performance in the FRS better than composite score. The first attempt was to look at the stages most like the FRSs: ACM, WEPs and CQ. Adding these three GPAs together and then comparing them to FRS ranking yielded the results below for VFA-122:



It is possible that a stage NSS, vice GPA, would have yielded better results, but very few of the *Naval Aviation Training Jacket (ATJ) Summary Card*s and *Naval Aviator Training Stage Grades – Jet* forms included individual stage NSSs.

We next ran a linear regression of each VT stage grade against FRS final ranking and found BI, ONAV and WEPs were the top three. Adding these grades together and comparing them to FRS ranking yielded the following results (ACM was a close 4th, so we looked at that as well):





While this is slightly better than straight Composite score, it required far more effort to get the data and was found to be unworthy of the effort.

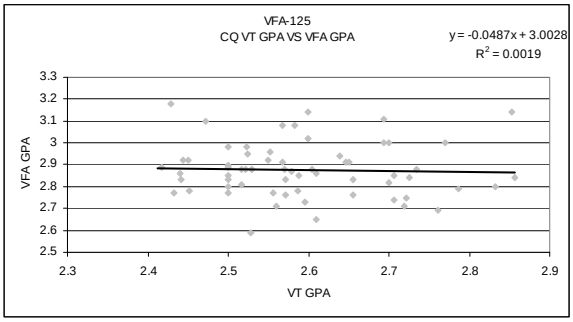
A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-22 sent their 'A-Team' to VFA-125 and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-22 was better than the rest? Or was it just because VT-22 had 'gamed' the system for the best FRS ranking?

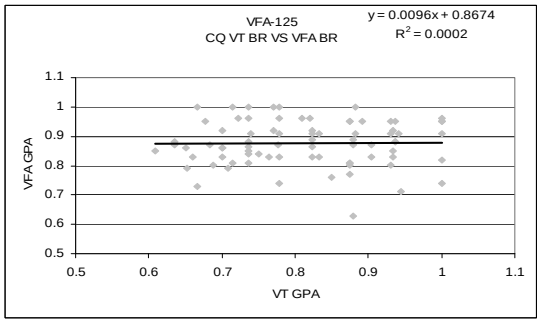
The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-21 sent the highest average composite score to VFA-125. If the linear regression we ran on the VFA-125 population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 45.57 upon FRS completion. Their average graduate actually ranked 51.5, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of -5.93. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VFA-125 are below.

VFA 125							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	3.036	50.012	198.592	3.042	54.440	52.066	-2.374
VT-9	3.034	51.035	204.483	3.048	44.652	48.847	4.195
VT-21	3.031	52.559	210.481	3.044	51.500	45.570	-5.930
VT-22	3.034	52.917	209.750	3.051	40.167	45.969	5.802
VFA 125	3.034	51.631	205.826	3.047	47.690	48.113	0.423

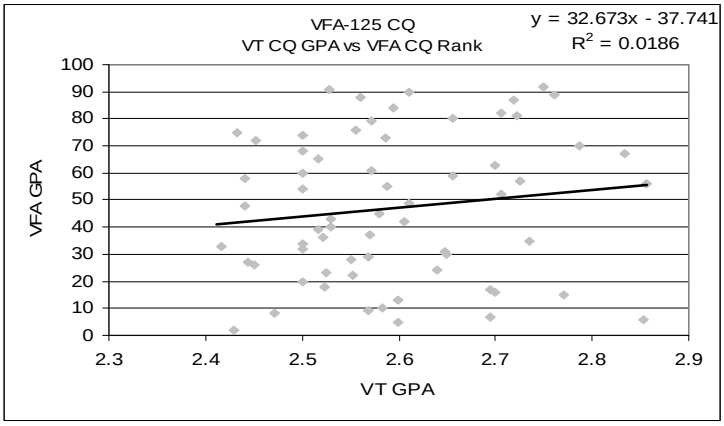
Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end.

Carrier Qualification. Phase 1 work on VFA-125 CQ resulted in 63 complete data points. Complete data points had VT CQ GPA (grades at the ship, not CQ Stage GPA), VT Boarding Rate (BR), FRS CQ GPA, and FRS BR.

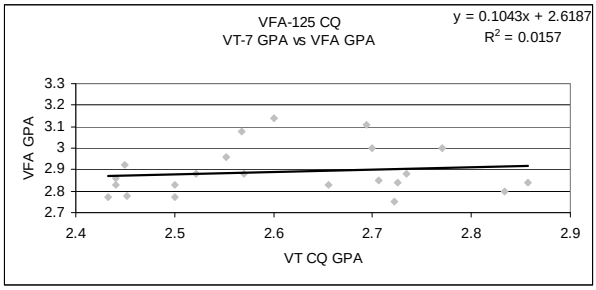


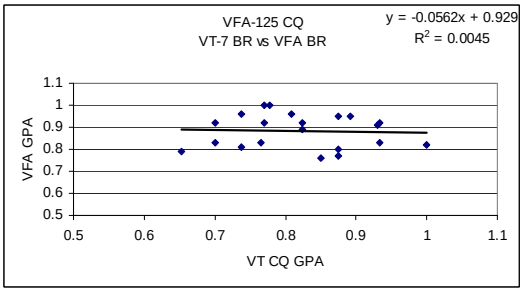


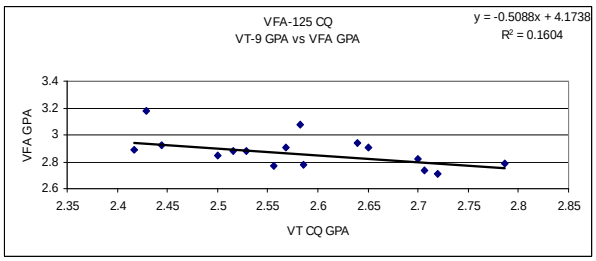
The tight grouping of data around 3.0 hurt overall correlation. An attempt was made to "draw out" the FRS CQ grades by ranking these from first to last. Unfortunately, r^2 was not improved.

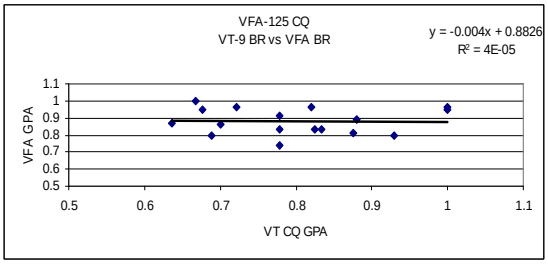


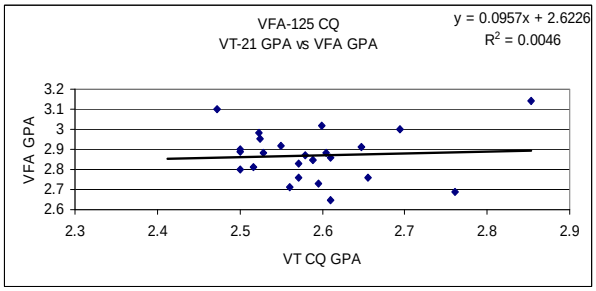
Individual VT Squadron data is graphed below.

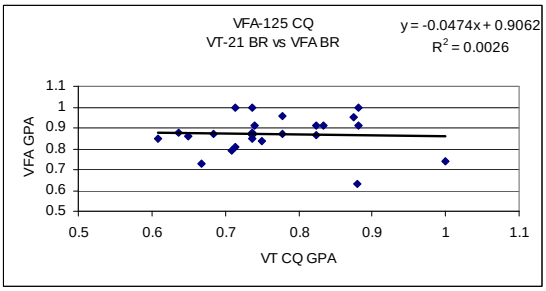


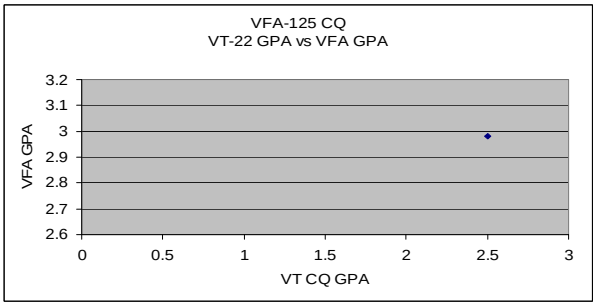


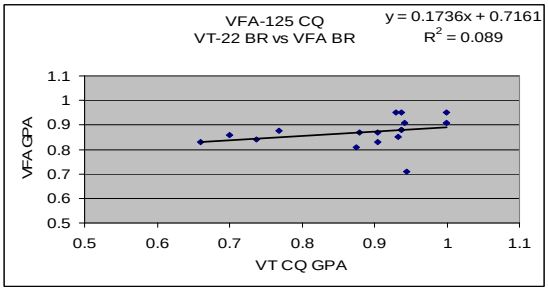












Note: VT-22 only had one data point usable for the VFA-125 GPA vs VFA GPA study, which is why there is no regression data available for them.

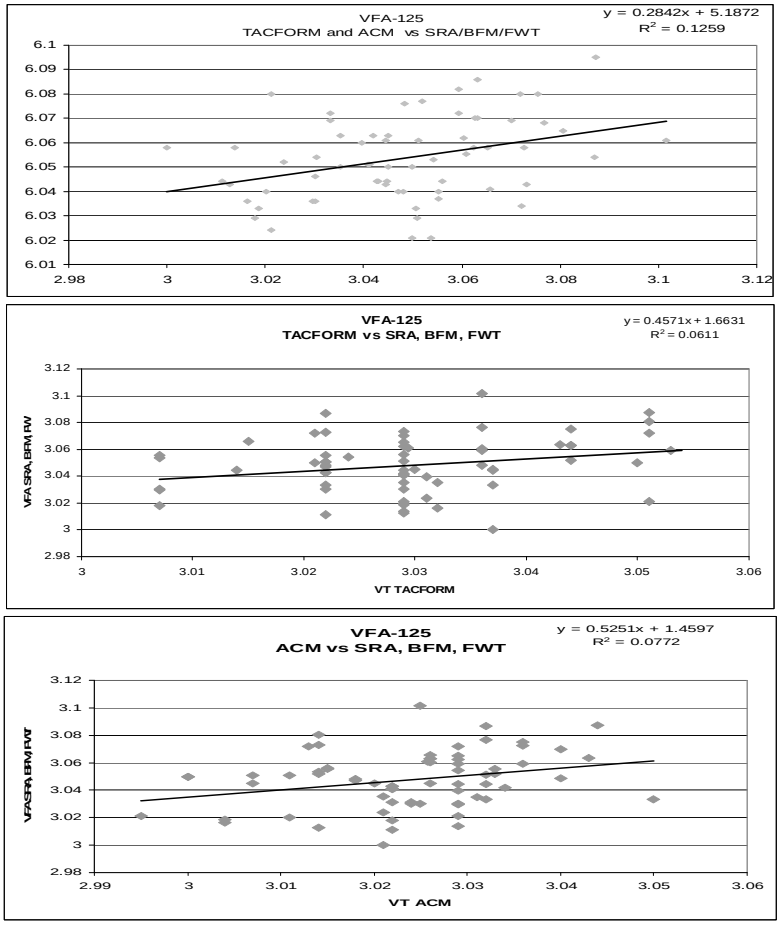
There was low correlation (r^2<.05) between VT grades and FRS performance regardless of how the data was sorted. Having said that, VT-7's graduates were the most successful in VFA-125.

VFA-125									
	VT		VFA						
Squadron	GPA	BR	GPA	BR	Day GPA	Day BR	Nt GPA	Nt BR	CQ Rank
VT-7	2.62	82.3%	2.91	88.7%	2.90	90.7%	2.92	86.2%	42.1
VT-9	2.60	80.5%	2.87	88.2%	2.89	90.8%	2.84	84.0%	45.9
VT-21	2.58	76.8%	2.87	87.5%	2.89	90.2%	2.83	84.5%	47.8
VT-22	2.50	88.1%	2.87	87.6%	2.85	89.1%	2.88	85.5%	51.7
VFA-125	2.60	81.4%	2.88	88.0%	2.89	90.3%	2.87	85.1%	46.5
STD	0.11148549	0.105332743	0.125171058	0.075250931	0.124707325	0.072810994	0.19402384	0.124664629	

91 Rank Data Points
63 Complete Data Points

Further investigation of CQ grades was abandoned in Phase 2 due to the low correlation between VT grades and FRS performance in CQ.

Fighter Weapons. An attempt to identify a "Center of Excellence" for the Air to Air mission lead us to compare ACM, TAC FORM, Fighter Weps and Strike Fighter syllabi. Yet again we had limited success predicting FRS performance using VT stage grades.



That having been said, VT-9 graduates performed well in the Air-to-Air arena.

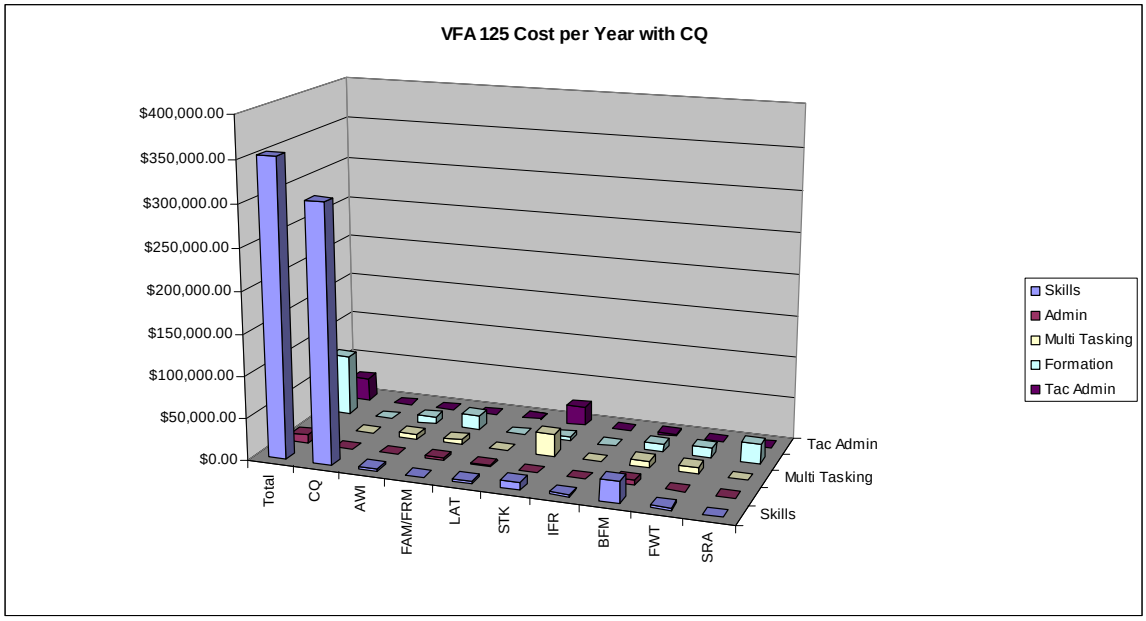
VFA-125			
	TACFORM	**ACM**	**SRA/BFM/FWT**
VT-7	3.032153846	3.021692308	3.0426265
VT-9	3.030813636	3.019808333	3.054718333
VT-21	3.026192308	3.024576923	3.043775294
VT-22	3.028315789	3.03235	3.05027
VFA-125	3.029386022	3.024222917	3.047575735
STD DEV	0.010336108	0.010250325	0.020578324

This thought may not have run its course. It is possible that using VT Stage NSSs, vice GPAs, could improve correlation. Future data collection should further explore the idea.

SoD Analysis

VFA-125 had 315 flight SoDs, of which 52 were complete SoDs and fully analyzed for the report. We had to take an average of the CQ DQ's because the complete SoDs (52) only had one CQ DQ. So an average was taken from all of the CQ DQ's we had dating back to 2001 (13) and we came up with a yearly average. From there we added that average to the number of years (3.5) our complete SoDs covered, which gave us a reasonable number for the CQ DQ's (7). The analysis was run both with and without the carrier qualification data due to the fact that a failure at the boat or at the FCLP resulted in an additional 20 flights and an overshadowing cost in the *Skills* category. The analysis was also run with and without F-5 aircraft being accounted for.

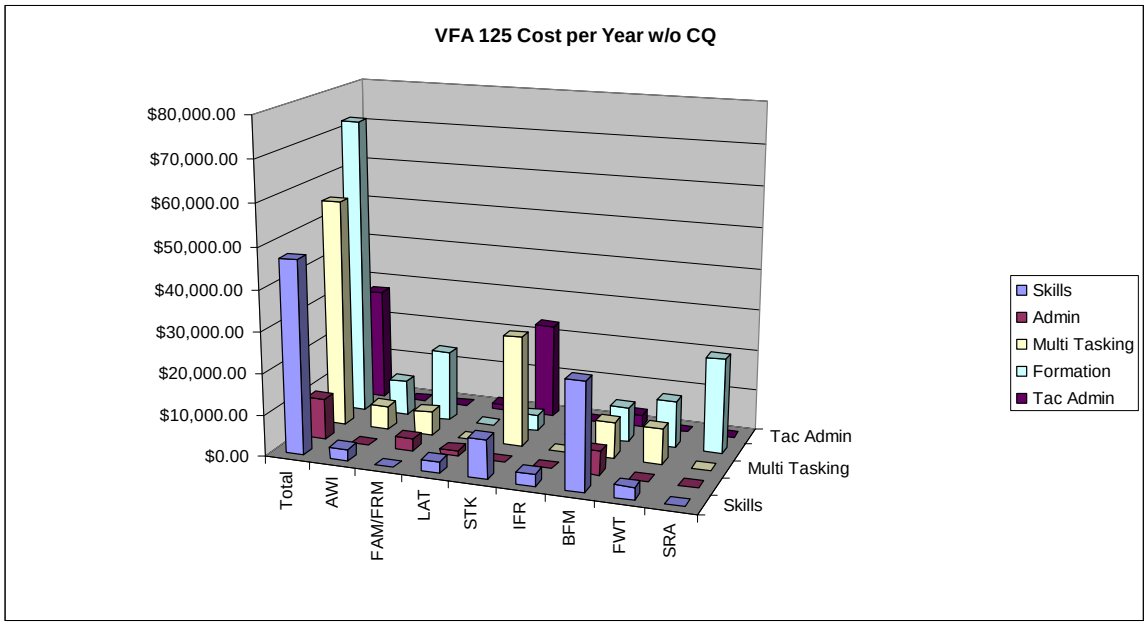
Re-flying FCLP and CQ periods drives 59.04% of the total annual SoD costs. Other skill errors push *Skills* up to 68.08% of the total. *Formation* (14.03%) and *Multi Tasking* (10.7%) were second and third. Which is slightly different then the Overall SoD Cost chart because *Formation* is usually third with *Multi Tasking* taking second. *Tac Admin* (5.26%) and *Admin* (1.94%) complete the causes' costs.



The spreadsheet below provides the dollar amounts.

VFA 125 Cost per Year w/CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Cost
Total	$353,331.68	$10,054.43	$55,529.16	$72,794.04	$27,290.58	$518,999.89	100.00%
CQ	$306,420.60	$0.00	$0.00	$0.00	$0.00	$306,420.60	59.04%
AWI	$2,872.69	$0.00	$5,745.39	$8,618.08	$0.00	$17,236.16	3.32%
FAM/FRM	$0.00	$2,872.69	$5,745.39	$17,236.16	$0.00	$25,854.24	4.98%
LAT	$2,872.69	$1,436.35	$0.00	$0.00	$1,436.35	$5,745.39	1.11%
STK	$9,566.07	$0.00	$26,802.23	$3,849.41	$22,981.54	$63,199.25	12.18%
IFR	$2,872.69	$0.00	$0.00	$0.00	$0.00	$2,872.69	0.55%
BFM	$25,854.24	$5,745.39	$8,618.08	$8,618.08	$2,872.69	$51,708.48	9.96%
FWT	$2,872.69	$0.00	$8,618.08	$11,490.77	$0.00	$22,981.54	4.43%
SRA	$0.00	$0.00	$0.00	$22,981.54	$0.00	$22,981.54	4.43%
%Cost	68.08%	1.94%	10.70%	14.03%	5.26%	100.00%	

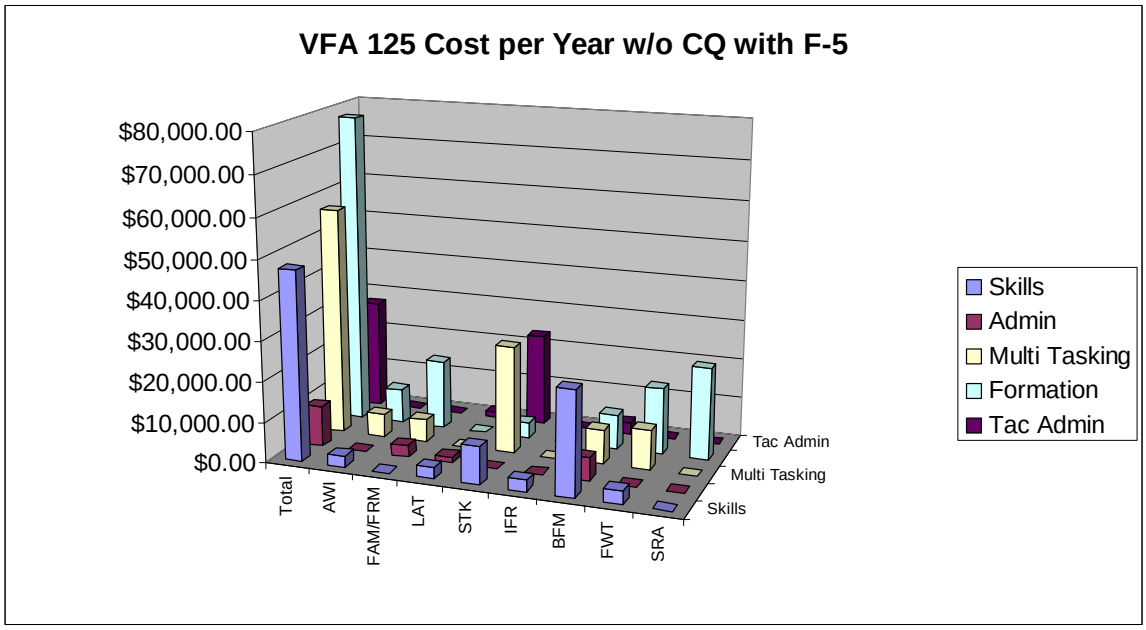
The annual SoD Cost chart below does not include CQ and provides improved granularity into other SoD causes. *Formation* (34.24%), *Multi Tasking* (26.12%), and *Skills* (22.07%) are the top three expensive SoD causes. This is slightly different then the Overall SoD Cost chart, because typically *Multi Tasking* is first with *Formation* taking second. Yet again, *Tac Admin* (12.84%) and *Admin* (4.73%) are the least expensive types of errors.



The spreadsheet below provides the dollar amounts.

VFA 125 Cost per Year w/o CQ (w/o F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Cost**
Total	$46,911.08	$10,054.43	$55,529.16	$72,794.04	$27,290.58	$212,579.29	100.00%
AWI	$2,872.69	$0.00	$5,745.39	$8,618.08	$0.00	$17,236.16	8.11%
FAM/FRM	$0.00	$2,872.69	$5,745.39	$17,236.16	$0.00	$25,854.24	12.16%
LAT	$2,872.69	$1,436.35	$0.00	$0.00	$1,436.35	$5,745.39	2.70%
STK	$9,566.07	$0.00	$26,802.23	$3,849.41	$22,981.54	$63,199.25	29.73%
IFR	$2,872.69	$0.00	$0.00	$0.00	$0.00	$2,872.69	1.35%
BFM	$25,854.24	$5,745.39	$8,618.08	$8,618.08	$2,872.69	$51,708.48	24.32%
FWT	$2,872.69	$0.00	$8,618.08	$11,490.77	$0.00	$22,981.54	10.81%
SRA	$0.00	$0.00	$0.00	$22,981.54	$0.00	$22,981.54	10.81%
%Cost	22.07%	4.73%	26.12%	34.24%	12.84%	100.00%	

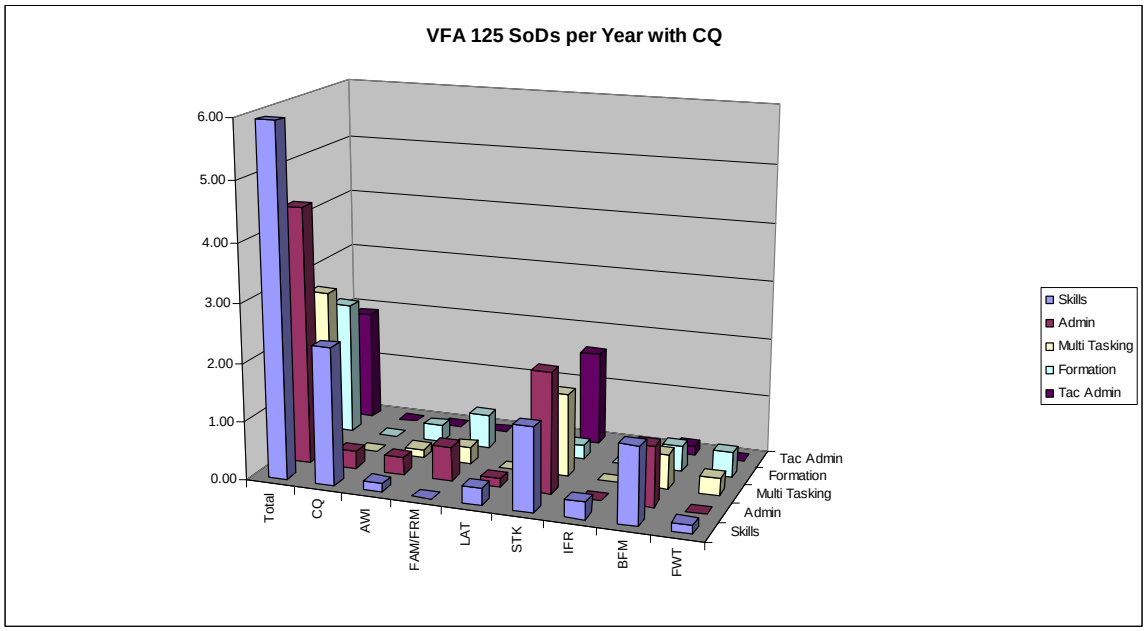
Lastly the analysis was run without the CQ data, but with the F-5 costs included. *Formation* (35.52%), *Multi Tasking* (25.89%), and *Skills* (21.57%) are the top three expensive SoD causes. Like before VFA-125 differs slightly from the Overall SoD Cost chart with *Formation* being the leading cost instead of *Multi Tasking*. Yet again, *Tac Admin* (12.44%) and *Admin* (4.58%) are the least expensive types of errors. The overall cost increased $6,848.55 and the percent change was an increase of 3.12%.



The spreadsheet below provides the dollar amounts.

VFA 125 Cost per Year w/o CQ with F-5							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Cost**
Total	$47,339.11	$10,054.43	$56,813.26	$77,930.45	$27,290.58	$219,427.84	100.00%
AWI	$2,872.69	$0.00	$5,745.39	$8,618.08	$0.00	$17,236.16	7.86%
FAM/FRM	$0.00	$2,872.69	$5,745.39	$17,236.16	$0.00	$25,854.24	11.78%
LAT	$2,872.69	$1,436.35	$0.00	$0.00	$1,436.35	$5,745.39	2.62%
STK	$9,566.07	$0.00	$26,802.23	$3,849.41	$22,981.54	$63,199.25	28.80%
IFR	$2,872.69	$0.00	$0.00	$0.00	$0.00	$2,872.69	1.31%
BFM	$25,854.24	$5,745.39	$8,618.08	$8,618.08	$2,872.69	$51,708.48	23.57%
FWT	$3,300.73	$0.00	$9,902.18	$16,627.18	$0.00	$29,830.09	13.59%
SRA	$0.00	$0.00	$0.00	$22,981.54	$0.00	$22,981.54	10.47%
%Cost	21.57%	4.58%	25.89%	35.52%	12.44%	100.00%	

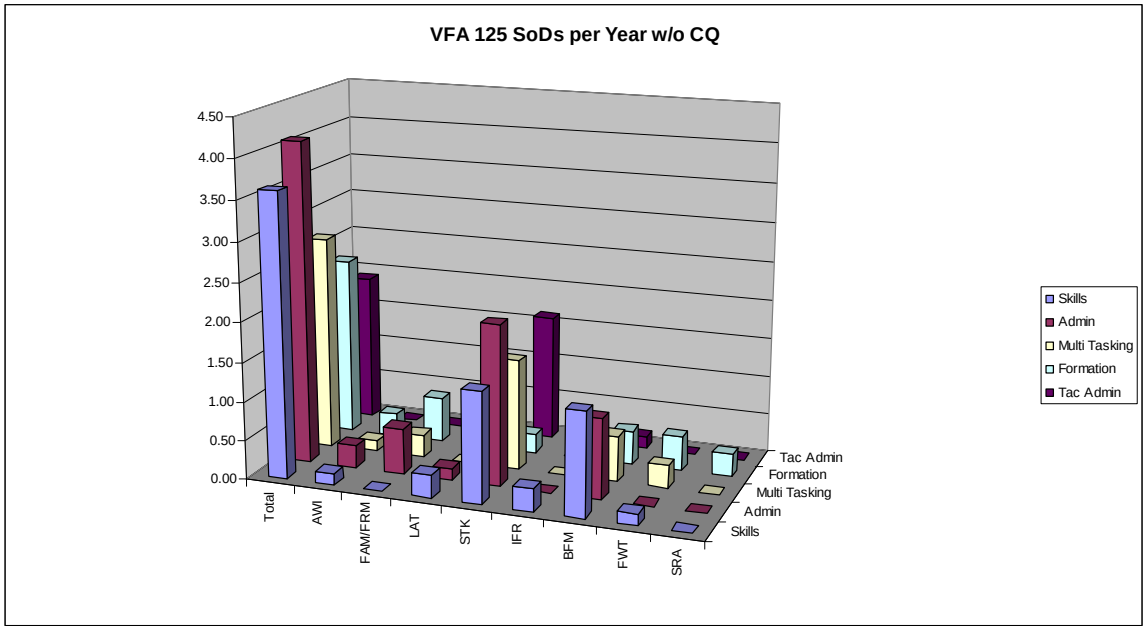
The annual SoD Cause chart below shows the most impactful errors to RAC grades in VFA-122. The chart includes CQ errors. *Skills* (34.47% w/ CQ alone making up 15.25%), *Admin* (25.42%), and *Multi Tasking* (15.81%) are the top three SoD causes. *Formation* (13.27%) and *Tac Admin* (11.02%) impact RAC grades least. The Overall SoD Cause chart has *Tac Admin* fourth then *Formation* fifth so VFA-125 is different in that regard.



The spreadsheet below provides the specifics.

VFA 125 SoDs per Year w/CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Total
Total	5.95	4.39	2.73	2.29	1.90	17.27	100.00%
CQ	2.34	0.29	0.00	0.00	0.00	2.63	15.25%
AWI	0.15	0.29	0.15	0.29	0.00	0.88	5.08%
FAM/FRM	0.00	0.59	0.29	0.59	0.00	1.46	8.47%
LAT	0.29	0.15	0.00	0.00	0.15	0.59	3.39%
STK	1.42	2.05	1.41	0.24	1.61	6.73	38.98%
IFR	0.29	0.00	0.00	0.00	0.00	0.29	1.69%
BFM	1.32	1.02	0.59	0.44	0.15	3.51	20.34%
FWT	0.15	0.00	0.29	0.44	0.00	0.88	5.08%
SRA	0	0	0	0.29268293	0	0.29	1.69%
%Total	34.47%	25.42%	15.81%	13.27%	11.02%	100.00%	

The annual SoD Cause chart below shows the most impactful errors to RAC grades in VFA-125. This chart does not include CQ errors. *Admin* (28.00%), *Skills* (24.68%), and *Multi Tasking* (18.66%) are the top three SoD causes. *Formation* (15.66%) and *Tac Admin* (13.00%) impact RAC grades least. This differs from the Overall SoD Cause chart because *Multi Tasking* is second with *Skills* third, and *Formation* is usually fifth with *Tac Admin* in fourth.



The spreadsheet below provides the specifics.

VFA 125 SoDs per Year w/o CQ (w/o F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Total**
Total	3.61	4.10	2.73	2.29	1.90	14.63	100.00%
AWI	0.15	0.29	0.15	0.29	0.00	0.88	6.00%
FAM/FRM	0.00	0.59	0.29	0.59	0.00	1.46	10.00%
LAT	0.29	0.15	0.00	0.00	0.15	0.59	4.00%
STK	1.42	2.05	1.41	0.24	1.61	6.73	46.00%
IFR	0.29	0.00	0.00	0.00	0.00	0.29	2.00%
BFM	1.32	1.02	0.59	0.44	0.15	3.51	24.00%
FWT	0.15	0.00	0.29	0.44	0.00	0.88	6.00%
SRA	0.00	0.00	0.00	0.29	0.00	0.29	2.00%
%Total	24.68%	28.00%	18.66%	15.66%	13.00%	100.00%	

Early in Phase 1 we received a STUCON access database with 315 SoDs, however, these SoDs were missing a reason and therefore could not be analyzed for cause. This was a significant amount of data and it is presented here for full disclosure.

Below is the summary of VFA-125 flights required post SoD and overall cost with and without CQ for the larger (315) SoD dataset.

VFA 125

	Extra Training Awarded for the SoD											
	Redo Phase/ Requal	ET Flight	ET SIM	Refly	Brief	PRB	HFB	FNAEB	Nothing	Students	SOD	Percent /Stage
AWI	0	5	5	7	0	0	1	0	1	11	12	3.81%
FAM/FRM/INST	0	16	6	28	0	0	0	1	4	33	36	11.43%
LAT	0	10	1	9	0	0	1	0	3	11	13	4.13%
STK	0	26	11	70	1	0	10	0	21	84	104	33.02%
BFM	0	31	1	47	1	0	0	1	9	58	66	20.95%
FWT	1	10	5	30	0	4	3	1	3	35	41	13.02%
SRA	0	12	3	17	0	0	1	0	0	19	19	6.03%
CQ	13	1	0	2	0	1	1	3	4	21	22	6.98%
IFR/OTHER	0	0	0	1	0	0	0	0	1	2	2	0.63%
Total	14	111	32	211	2	5	17	6	46		315	
Average per Year	2.43	19.30	5.57	36.70	0.35	0.87	2.96	1.04	8.00		54.78	

	Flights Required post-SoD			Flight Hours		Cost	
	Total F/A-18	TOTAL F-5	TOTAL T-34	Flight Hours	Flight Hours w/o CQ	Cost Per Phase	
AWI	24	0	0	28.8	28.8	$235,560.83	3.04%
FAM/FRM/INST	69	0	0	82.8	82.8	$677,237.40	8.74%
LAT	19	0	0	22.8	22.8	$186,485.66	2.41%
STK	140	0	0	168	168	$1,374,104.87	17.73%
BFM	155	0	0	186	186	$1,521,330.39	19.63%
FWT	93	74	0	111.6	111.6	$912,798.23	11.78%
SRA	116	0	0	139.2	139.2	$1,138,544.03	14.69%
CQ	259	0	0	207.2		$1,694,729.34	21.87%
IFR/OTHER	1	0	0	1.2	1.2	$9,815.03	0.13%
Total	876	74	0	947.6	740.4	$7,750,605.80	

# Quarters	23
Total Cost	$7,750,605.80
Total Cost w/o CQ	$6,055,876.46
Cost Per Year with CQ	$1,347,931.44

4th QTR FY01 through 2nd QTR FY07

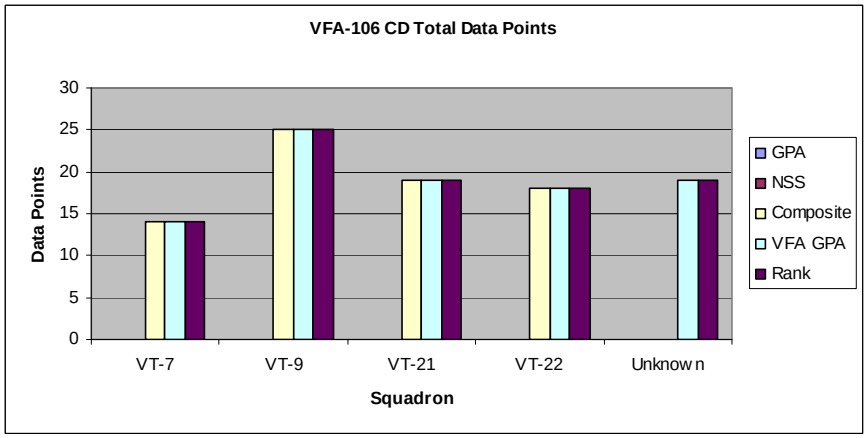
Was 322 ETs and 13 CQ

948 F/A-18A/B/C/D Flight Hours, 165 per Year

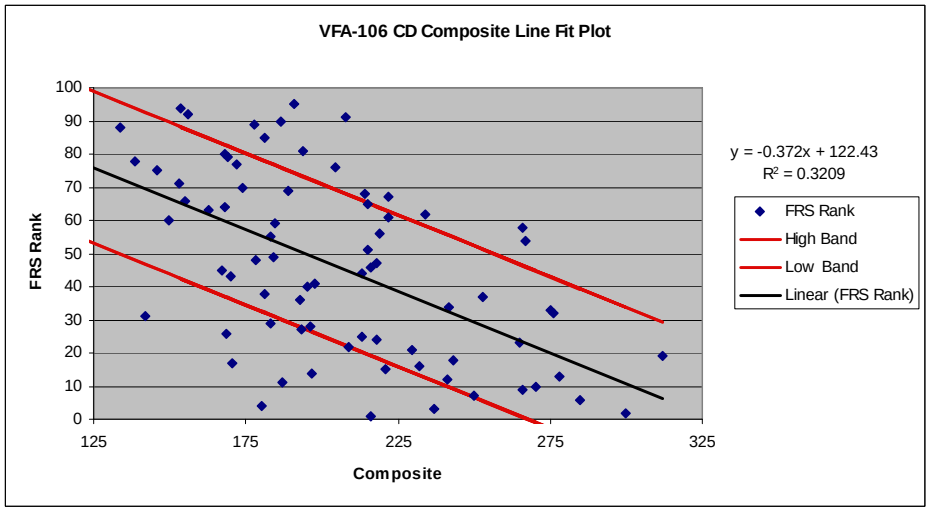
VFA-106 CD

Squadron Report

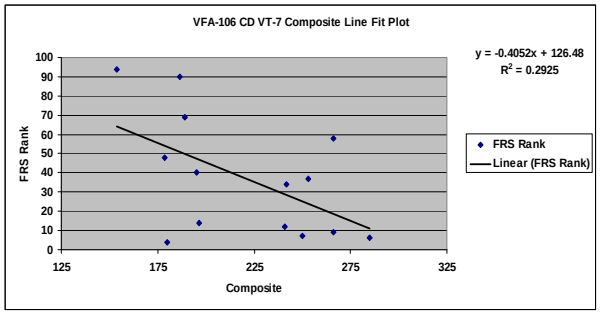
Grade Data. Data was gathered from 100 students from VFA-106 CD. 78 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.

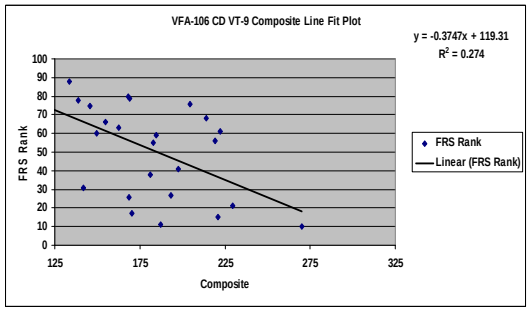


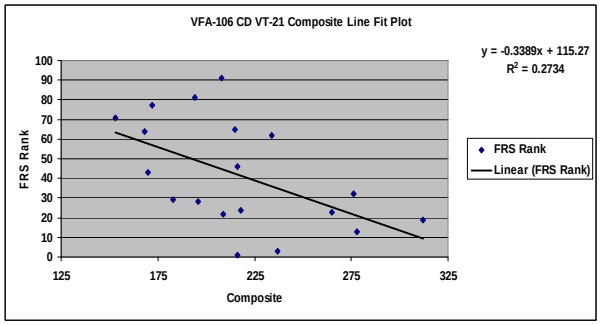
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator.

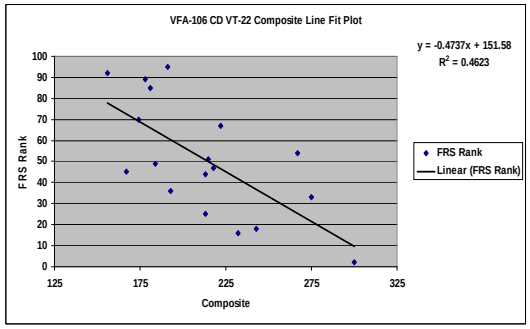


Below are the linear regressions for VFA-106 CD broken down by VT squadrons.

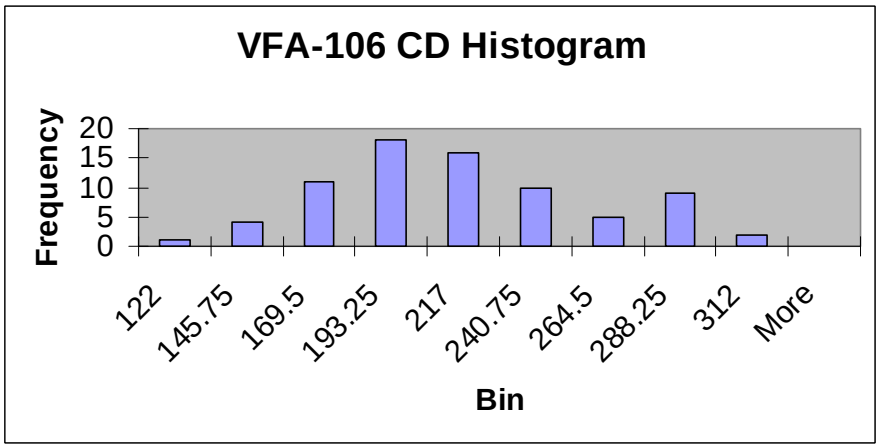








A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VFA-106 CD had a relatively standard quality spread, resembling a bell curve.



Dead End

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-7 sent their 'A-Team' to VFA-106 CD and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-9 was better than the rest? Or was it just because VT-7 had 'gamed' the system for the best FRS ranking?

The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-7 sent the highest average composite score to VFA-106 CD. If the linear regression we ran on the VFA-106 CD population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 40.551 upon FRS completion. Their average graduate actually ranked 37.286, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of 3.265. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VFA-106 CD are below.

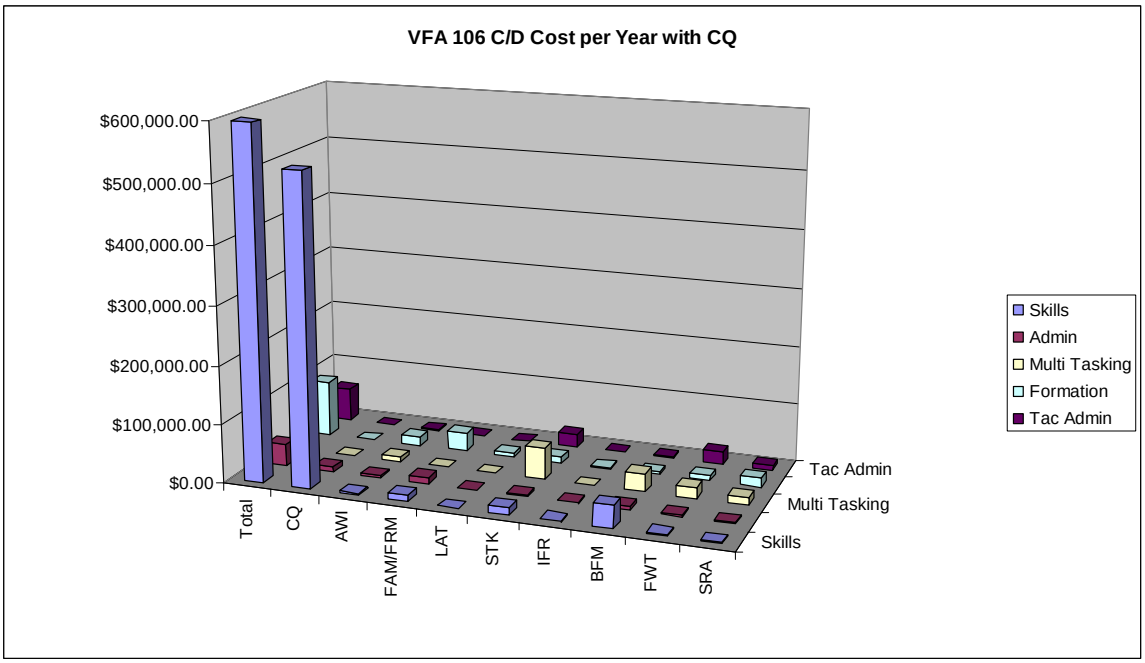
VFA 106 CD							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	NA	NA	220.114	3.039	37.286	40.551	3.265
VT-9	NA	NA	181.310	3.015	51.360	54.986	3.626
VT-21	NA	NA	216.842	3.032	41.789	41.768	-0.021
VT-22	NA	NA	212.333	3.007	51.000	43.446	-7.554
VFA 106 CD	NA	NA	207.650	3.023	45.359	45.188	-0.171

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end.

SoD Analysis

VFA-106 CD had 209 flight SoDs that were analyzed in the report. The analysis was run both with and without the carrier qualification data due to the fact that a failure at the boat or at the FCLP resulted in an additional 20 flights and an overshadowing cost in the *Skills* category.

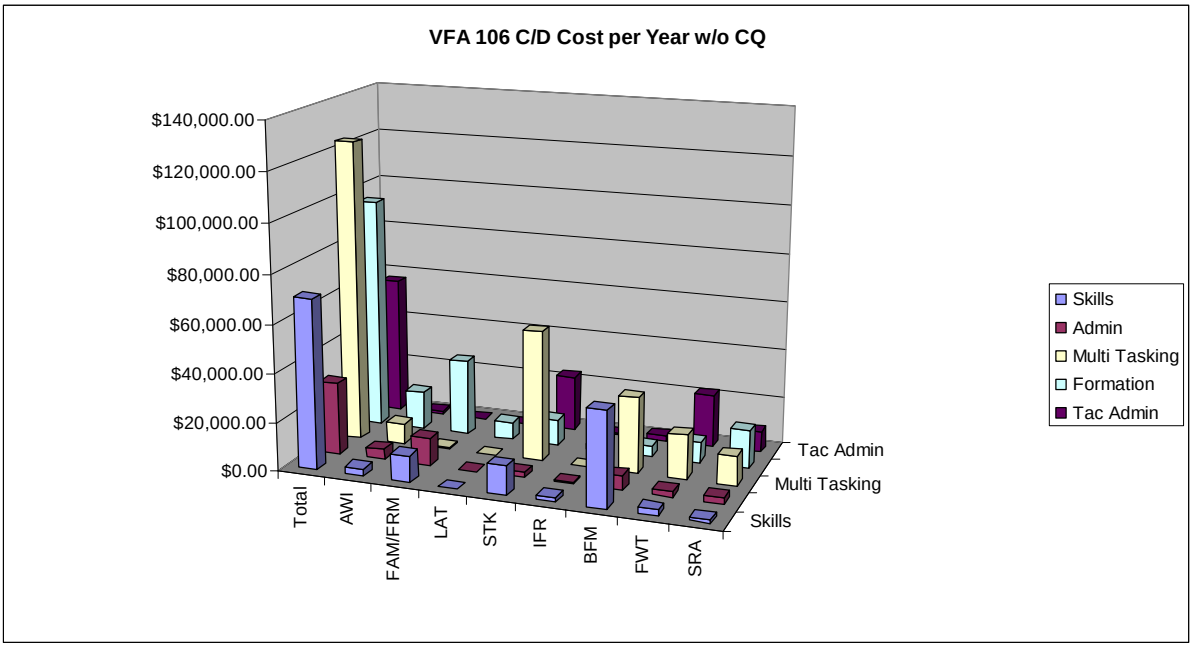
Re-flying FCLP and CQ periods drives 58.59% of the total annual SoD costs. Other skill errors push *Skills* up to 65.4% of the total. *Multi Tasking* (13.65%) and *Formation* (10.52%) were second and third. *Tac Admin* (6.28%) and *Admin* (4.15%) complete the causes' costs.



The spreadsheet below provides the dollar amounts.

VFA 106 C/D Cost per Year with CQ (w/o F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Cost**
Total	$596,385.82	$37,843.54	$124,434.41	$95,936.40	$57,287.43	$911,887.60	100.00%
CQ	$526,166.84	$8,094.87	$0.00	$0.00	$0.00	$534,261.71	58.59%
AWI	$3,035.58	$4,249.81	$8,499.62	$15,785.01	$1,214.23	$32,784.24	3.60%
FAM/FRM	$10,928.08	$11,535.20	$607.12	$31,570.01	$0.00	$54,640.40	5.99%
LAT	$0.00	$0.00	$0.00	$7,285.39	$0.00	$7,285.39	0.80%
STK	$11,935.89	$2,428.46	$53,814.72	$10,733.80	$23,082.53	$101,995.42	11.19%
IFR	$1,821.35	$607.12	$0.00	$1,821.35	$607.12	$4,856.92	0.53%
BFM	$38,855.40	$6,071.16	$31,157.17	$4,456.23	$2,027.77	$82,567.72	9.05%
FWT	$2,428.46	$2,428.46	$18,213.47	$8,499.62	$21,856.16	$53,426.17	5.86%
SRA	$1,214.23	$2,428.46	$12,142.31	$15,785.01	$8,499.62	$40,069.63	4.39%
%Cost	65.40%	4.15%	13.65%	10.52%	6.28%	100.00%	

The annual SoD Cost chart below does not include CQ and provides improved granularity into other SoD causes. *Multi Tasking* (32.95%), *Formation* (25.41%), and *Skills* (18.59%) are the top three expensive SoD causes. Yet again, *Tac Admin* (15.17%) and *Admin* (7.88%) are the least expensive types of errors.

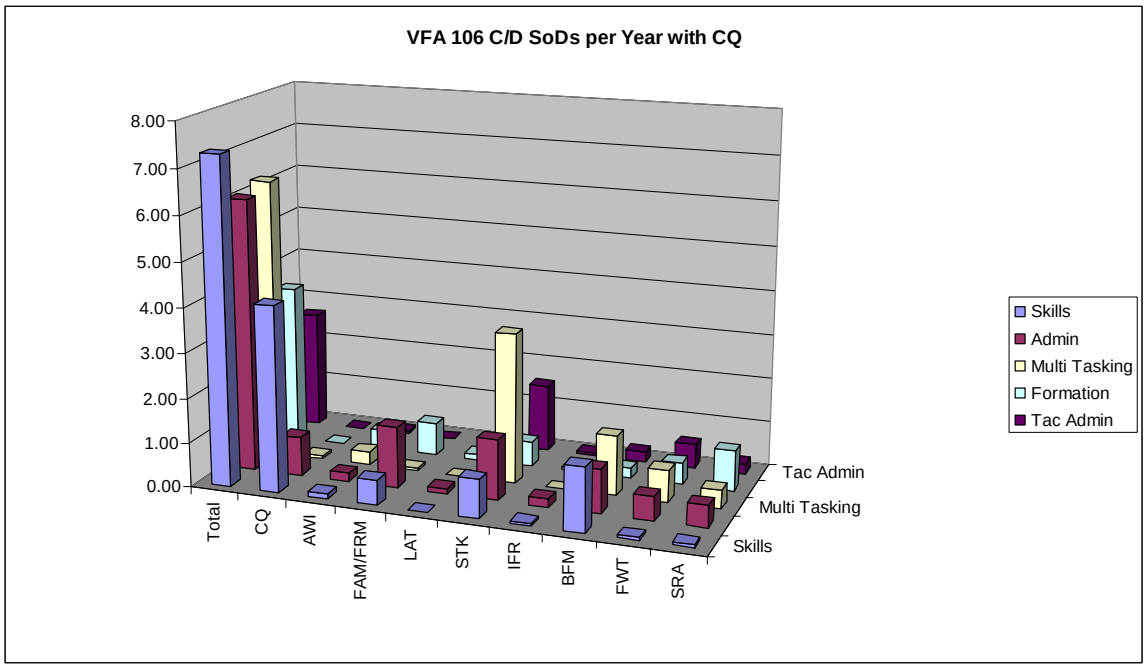


The spreadsheet below provides the dollar amounts.

VFA 106 C/D Cost per Year w/o CQ (w/o F-5)							
	Skills	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**	**Total**	**%Cost**
Total	$70,218.99	$29,748.66	$124,434.41	$95,936.40	$57,287.43	$377,625.89	100.00%
AWI	$3,035.58	$4,249.81	$8,499.62	$15,785.01	$1,214.23	$32,784.24	8.68%
FAM/FRM	$10,928.08	$11,535.20	$607.12	$31,570.01	$0.00	$54,640.40	14.47%
LAT	$0.00	$0.00	$0.00	$7,285.39	$0.00	$7,285.39	1.93%
STK	$11,935.89	$2,428.46	$53,814.72	$10,733.80	$23,082.53	$101,995.42	27.01%
IFR	$1,821.35	$607.12	$0.00	$1,821.35	$607.12	$4,856.92	1.29%
BFM	$38,855.40	$6,071.16	$31,157.17	$4,456.23	$2,027.77	$82,567.72	21.86%
FWT	$2,428.46	$2,428.46	$18,213.47	$8,499.62	$21,856.16	$53,426.17	14.15%
SRA	$1,214.23	$2,428.46	$12,142.31	$15,785.01	$8,499.62	$40,069.63	10.61%
%Cost	18.59%	7.88%	32.95%	25.41%	15.17%	100.00%	

Note: VFA-106 CD did not have any SoDs that required the use of F-5s, therefore the F-5 analysis found for VFA-122 and VFA-125 was not done for VFA-106 CD.

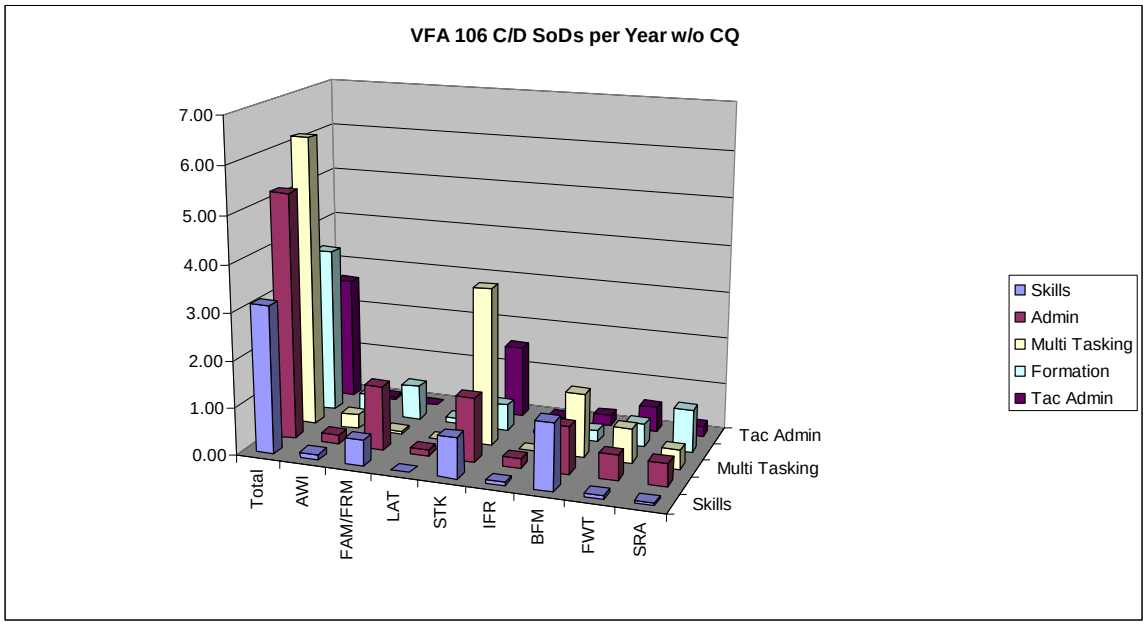
The annual SoD Cause chart below shows the most impactful errors to RAC grades in VFA-106 CD. The chart includes CQ errors. *Skills* (28.23% w/ CQ alone making up 19.62%), *Multi Tasking* (24.23%), *Admin* (23.60%), and are the top three SoD causes. *Formation* (13.73%) and *Tac Admin* (10.21%) impact RAC grades least. The Overall SoD Cause chart has *Admin* second then *Multi Tasking* third so VFA-106 CD is different in that regard.



The spreadsheet below provides the specifics.

VFA 106 C/D SoDs per Year with CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Total
Total	7.30	6.10	6.27	3.55	2.64	25.86	100.00%
CQ	4.1443	0.865979381	0.06185567	0	0	5.07	19.62%
AWI	0.12	0.19	0.31	0.43	0.06	1.11	4.31%
FAM/FRM	0.56	1.36	0.06	0.74	0.00	2.72	10.53%
LAT	0.00	0.12	0.00	0.12	0.00	0.25	0.96%
STK	0.87	1.36	3.36	0.56	1.53	7.67	29.67%
IFR	0.06	0.19	0.00	0.06	0.06	0.37	1.44%
BFM	1.42	0.99	1.34	0.23	0.23	4.21	16.27%
FWT	0.06	0.54	0.72	0.49	0.54	2.35	9.09%
SRA	0.06	0.49	0.41	0.91	0.23	2.10	8.13%
%Total	28.23%	23.60%	24.23%	13.73%	10.21%	100.00%	

The annual SoD Cause chart below shows the most impactful errors to RAC grades in the FRS. This chart does not include CQ errors. *Multi Tasking* (29.85%), *Admin* (25.2%), and *Formation* (17.08%) are the top three SoD causes. *Skills* (15.18%) and *Tac Admin* (12.7%) impact RAC grades least. This differs from the overall SoD Cause chart because *Admin* is first, then *Multi Tasking*, followed by *Skills* to round out the top three. The last two from the Overall SoD Cause chart are *Tac Admin* and *Formation*.



The spreadsheet below provides the specifics.

VFA 106 C/D SoDs per Year w/o CQ (w/o F-5)							
	Skills	Admin	Multi Tasking	Formation	Tac Admin	Total	%Total
Total	3.15	5.24	6.20	3.55	2.64	20.78	100.00%
AWI	0.12	0.19	0.31	0.43	0.06	1.11	5.36%
FAM/FRM	0.56	1.36	0.06	0.74	0.00	2.72	13.10%
LAT	0.00	0.12	0.00	0.12	0.00	0.25	1.19%
STK	0.87	1.36	3.36	0.56	1.53	7.67	36.90%
IFR	0.06	0.19	0.00	0.06	0.06	0.37	1.79%
BFM	1.42	0.99	1.34	0.23	0.23	4.21	20.24%
FWT	0.06	0.54	0.72	0.49	0.54	2.35	11.31%
SRA	0.06	0.49	0.41	0.91	0.23	2.10	10.12%
%Total	15.18%	25.20%	29.85%	17.08%	12.70%	100.00%	

Below is the summary of VFA-106 CD flights required post SoD and overall cost with and without CQ.

	VFA-106 CD Flights Required post-SoD		
	Total F/A-18	TOTAL F-5	TOTAL T-34
AWI	27	0	0
FAM/FRM	45	0	0
LAT	6	0	0
STK	84	0	0
IFR	4	0	0
BFM	68	0	0
FWT	44	0	0
SRA	33	0	0
CQ	660	0	0
Total	971	0	0
Aircraft Required per Year	120.12	0	0
Total Flight Hours	901.20	0	0
Annual Flight Hours	111.49	0	0

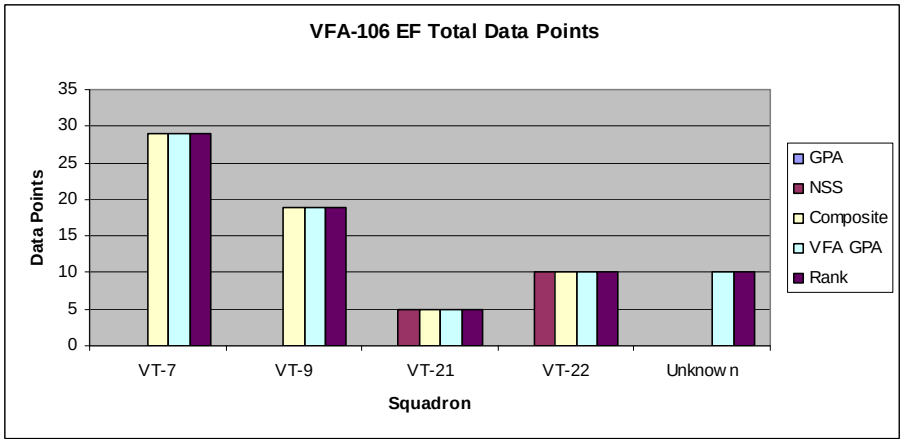
VFA-106 Data from MAR 2000 to NOV 2008 With CQ	
Total Months	97
# QRT	32.33
# Years	8.08
Total Cost	7,371,091.44
Cost / Year	$911,887.60
Cost/ QRT	$227,971.90

VFA-106 Data from MAR 2000 to NOV 2008 Without CQ	
Total Months	97
# QRT	32.33
# Years	8.08
Total Cost	3,052,475.95
Cost / Year	$436,067.99
Cost/ QRT	$109,017.00

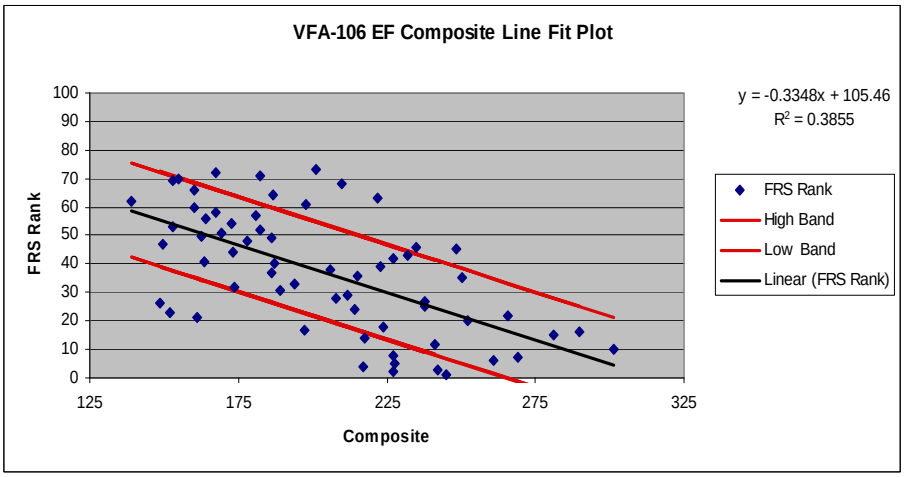
VFA-106 EF

Squadron Report

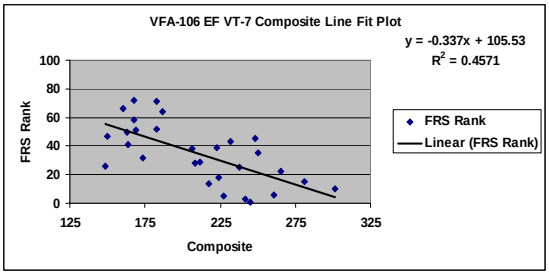
Grade Data. Data was gathered from 75 students from VFA-106 EF. 63 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank. There were also two students who were statistical outliers due to a VFA GPA that was unrealistically low (1.02, 1.18), so they were left out of all data analysis.

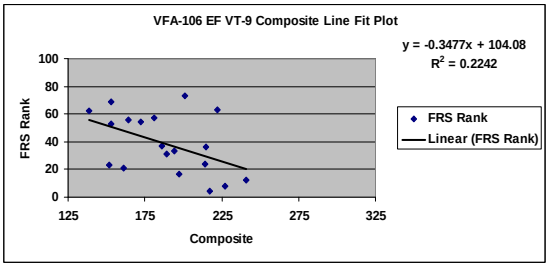


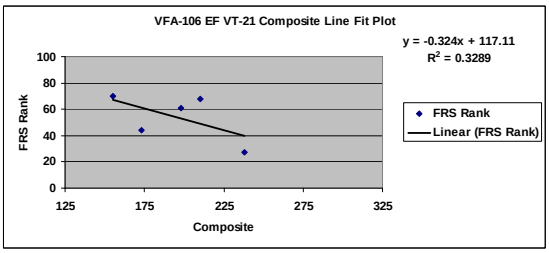
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator.

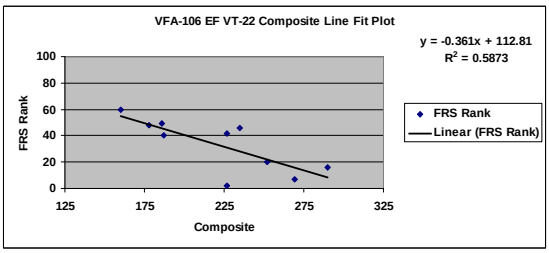


Below are the linear regressions for VFA-106 EF broken down by VT squadrons.

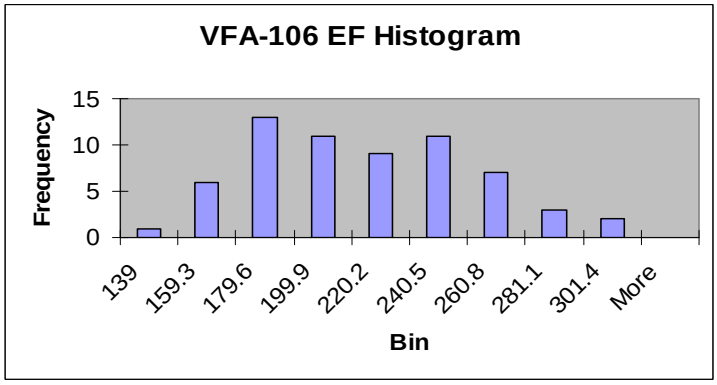








A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VFA-106 EF had a quality spread that had a bimodal distribution, yet still resembles a bell curve.



Dead End

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-21 sent their 'A-Team' to VFA-106 EF and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-21 was better than the rest? Or was it just because VT-21 had 'gamed' the system for the best FRS ranking?

The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-22 sent the highest average composite score to VFA-106 EF. If the linear regression we ran on the VFA-106 EF population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 34.008 upon FRS completion. Their average graduate actually ranked 33.000, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of 1.008. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VFA-106 EF are below.

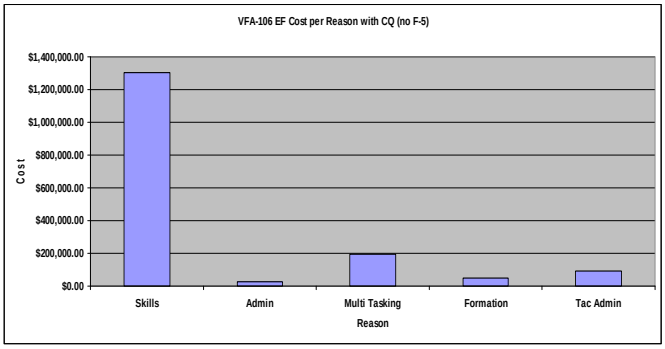
VFA 106 EF							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	NA	NA	210.207	3.023	34.690	35.092	0.402
VT-9	NA	NA	188.374	3.020	38.579	42.401	3.822
VT-21	NA	48.400	194.800	3.013	54.000	40.250	-13.750
VT-22	NA	55.600	221.100	3.026	33.000	34.008	1.008
VFA 106 EF	NA	52.000	203.620	3.021	40.067	37.938	-2.129

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end.

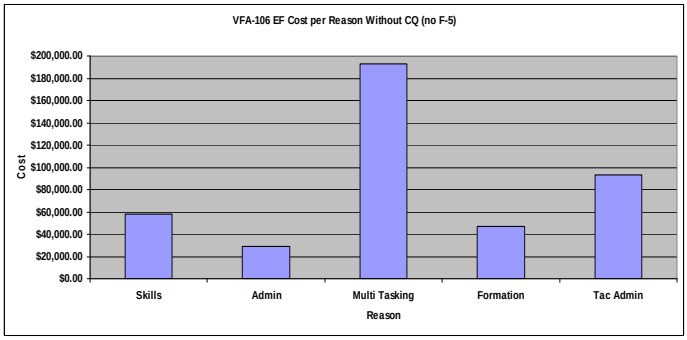
SoD Analysis

VFA-106 EF had 29 SoDs that had comments and were analyzed. We did not go into as much detail as VFA-106 CD due to the fairly low number of SoDs. *Multi Tasking*, *Tac Admin*, and *Skills* were the three leading cost related SoD reasons when the data was analyzed without CQ. This was surprising because typically *Formation* reasons are the second leading cause. Further research found a large population of F-14 retreads in VFA-106 EF at the time, resulting in an atypical SoD cause distribution.

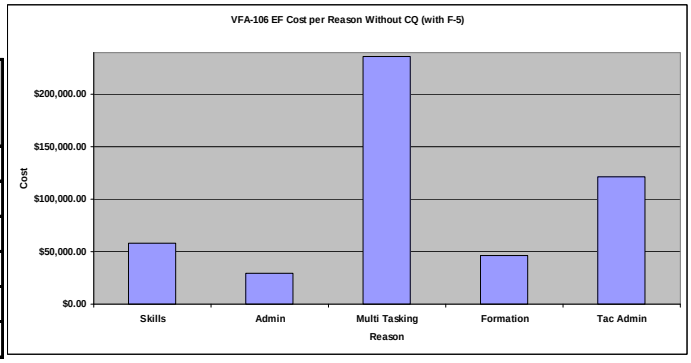
VFA-106 EF Data from JUL 2005 to APR 2008 With CQ	
Total Months	33
# QRT	11.00
# Years	2.75
Total Cost	$1,665,776.00
Cost / Year	$605,736.73
Cost/ QRT	$55,066.98



VFA-106 EF Data from JUL 2005 to APR 2008 w/o CQ	
Total Months	33
# QRT	11.00
# Years	2.75
Total Cost	$420,336.00
Cost / Year	$152,849.45
Cost/ QRT	$13,895.40



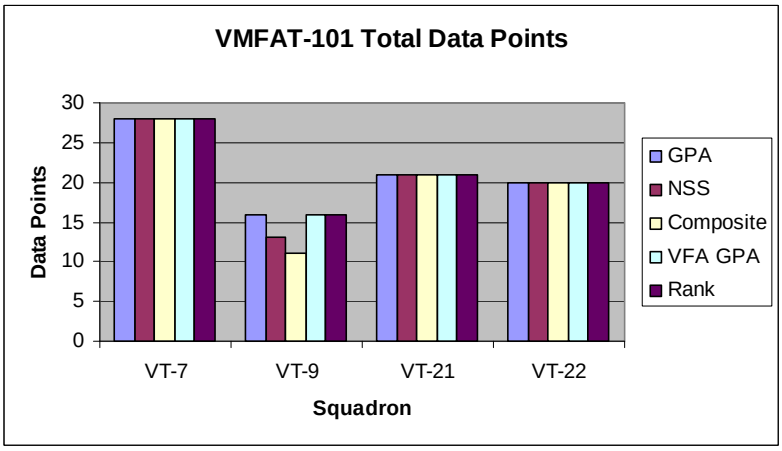
VFA-106 EF Data from JUL 2005 to APR 2008 w/o CQ w/F-5	
Total Months	33
# QRT	11.00
# Years	2.75
Total Cost	$492,129.00
Cost / Year	$178,956.00
Cost/ QRT	$16,268.73



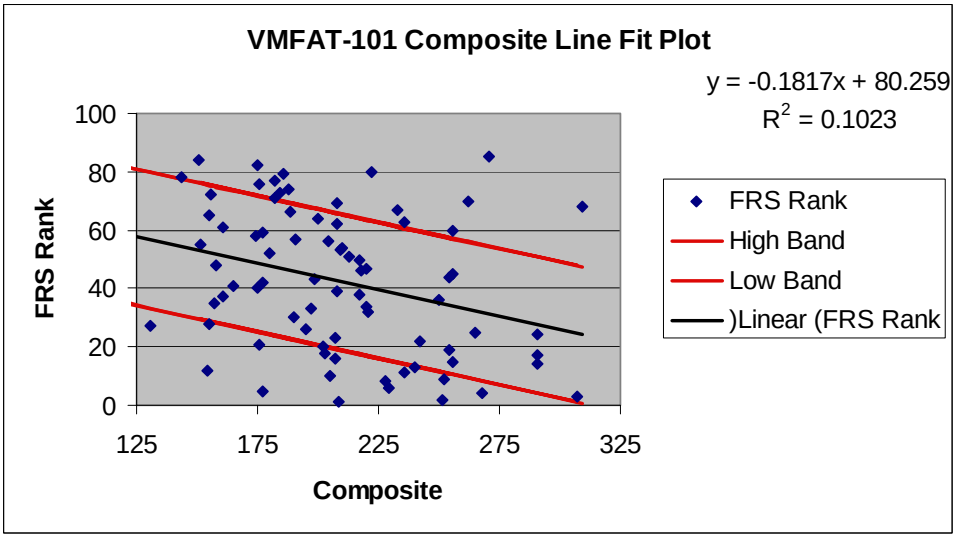
VMFAT-101

Squadron Report

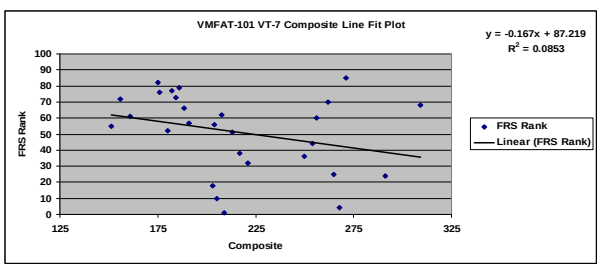
Grade Data. Data was gathered from 85 students from VMFAT-101. 80 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.

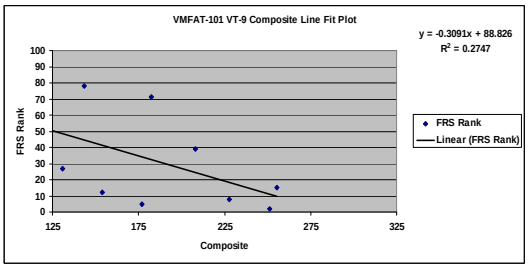


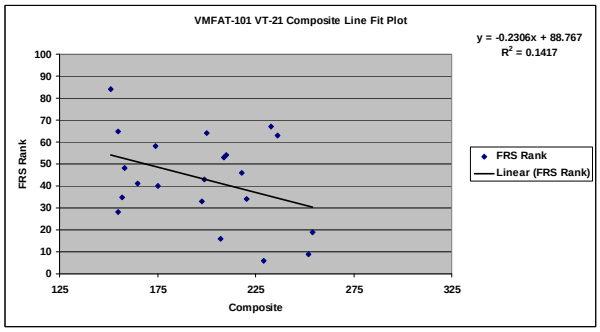
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator. This correlation is very low, especially when compared with Navy Hornet FRSs, which fly the same syllabus with a similar distribution talent.

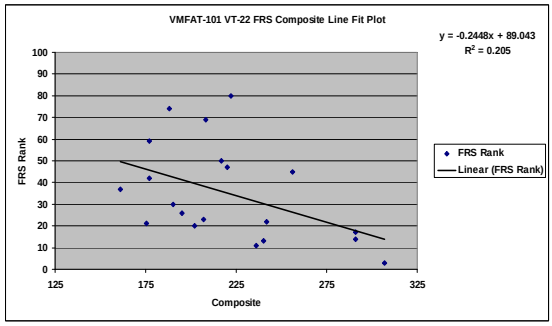


Below are the linear regressions for VMFAT-101 broken down by VT squadrons.

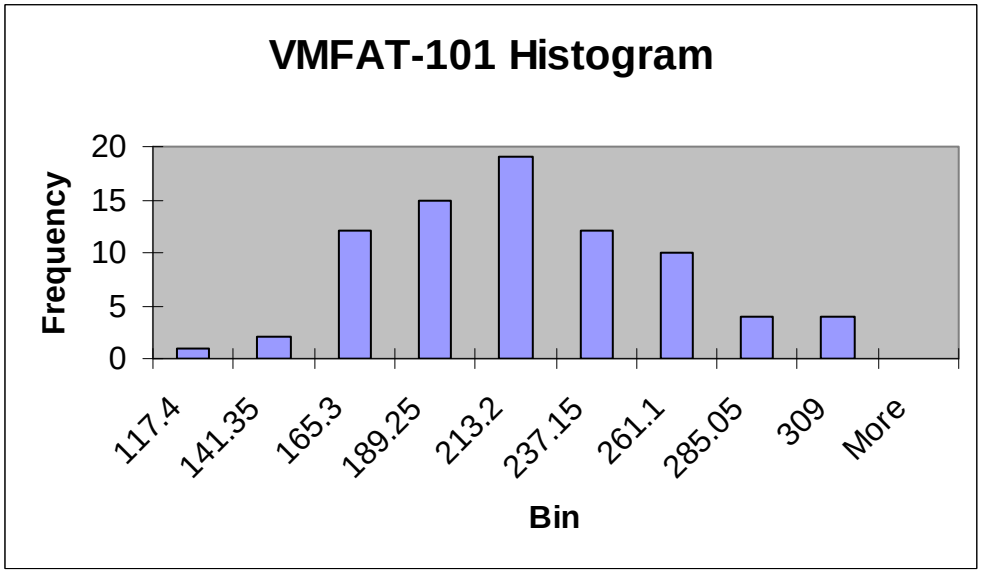








A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VMFAT-101 had a relatively standard quality spread, resembling a bell curve.



Dead End

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-9 sent their 'A-Team' to VMFAT-101 and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-9 was better than the rest? Or was it just because VT-9 had 'gamed' the system for the best FRS ranking?

The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-22 sent the highest average composite score to VMFAT-101. If the linear regression we ran on the VMFAT-101 population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 40.266 upon FRS completion. Their average graduate actually ranked 35.15, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of 5.116. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VMFAT-101 are below.

VMFAT 101							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	3.039	55.432	215.571	2.990	51.214	41.094	-10.120
VT-9	3.032	44.818	178.873	3.007	33.545	47.762	14.216
VT-21	3.029	49.381	197.829	2.996	43.143	44.318	1.175
VT-22	3.033	55.717	220.131	3.003	35.150	40.266	5.116
VMFAT101	3.033	51.337	203.101	2.999	40.763	43.360	2.597

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end. Considering the low r^2 for VMFAT-101, assuming an r^2 of 1.0 is too big a leap to make this "Estimated Rank" useful data.

SoD Analysis

VMFAT-101 had 12 flight SoDs and 6 sim SoDs. Due to the low amount of SoD data that was obtained no thorough analysis was run for this FRS.

									What Caused the SoD				
Rank	name	SSN	Class	Parent_phase	Date	flight	ET	Comments_overall	Skills	Admin	Multi Tasking	Formation	Tac Admin
LTJG	Willis			FAM	16-Aug-07	FFAM-107	yes	No takeoff checks		1			
1st LT	Parente			STK	8-Feb-08	FSTK-115	yes	Lack of altitude control in stack			1		
1st LT	Jurado			FRM	20-Feb-08	FFRM-104	yes	Poor Formation, Flown as Dash 4 for a Division Tac Form Hop.				1	
1st LT	Parente			STK	26-Feb-08	FSTK-116	no	Huge low pull			1		
1st LT	Jirovsky			STK	4-Mar-08	FSTK-115W	yes	System usage in CAS.			1		1
LTJG	Willis			FWT	26-Mar-08	FFWT-102	no	maneuvered nose low (70*) 1000' above HD	1		1		
1st LT	Sheedy			BFM	27-Mar-08	FBFM-102	no	Fought through bingo bug		1	1		
	Ambrose			FAM	27-Mar-08	FFAM-102	yes	mostly procedures airborne, just gets behind in the jet.		1	1		
1st LT	Pack			STK	11-Apr-08	FSTK-101	yes	Form, Bingo bug, Dive bombing			1	1	1
1st LT	Buras			STK	7-May-08	FSTK-115	yes	CAS Hop, drops without a cleared hot			1		1
1st LT	Melendez			STK	9-May-08	FSTK-117	yes	Admin, Lat checks, section CAS Low alt.		1	1		1
1st LT	Jurado			STK	10-May-08	FSTK-117	yes	Section CAS low level, latt checks			1		1
									1	4	10	2	5

12 Flight SoDs

	Ambrose			FAM	5-Mar-08	SFAM-105	yes	Crashed on takeoff, poor aircraft control and scan doing ILS/GCA.	1	1			
1st LT	Pack			FAM	10-Mar-08	SFAM-112	yes	IFR Buffunary	1	1			
LTJG	Booth			FAM	11-Mar-08	SFAM-112	yes	1FR Buffoonery	1	1			
	Macaloney			FAM	13-Sep-07	SFAM-107W	yes	unsat CRM/No SA, landed with 300# and did not recognize stuck throttle		1			
	Macaloney			FAM	16-Oct-07	SFAM-109W	no	NATOPS Buffoonery		1			
1st LT	Koehl			FAM	14-Feb-08	SFAM-110	yes	Ran off runway into water while landing at N. Island on his NATOPS check.		1			

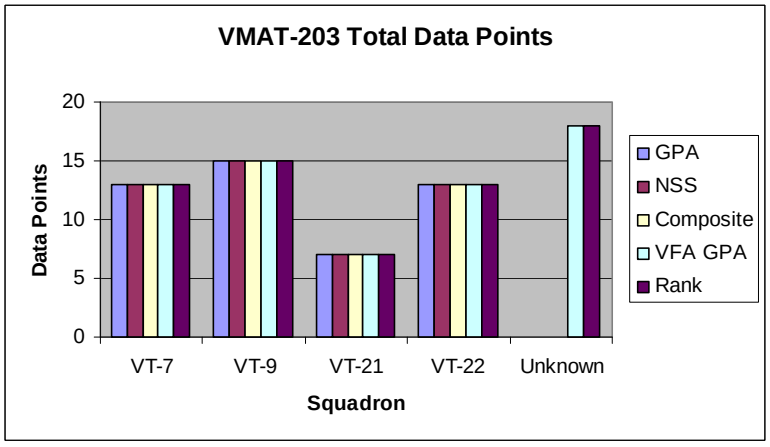
6 SIM SoDs

Total SoDs 18

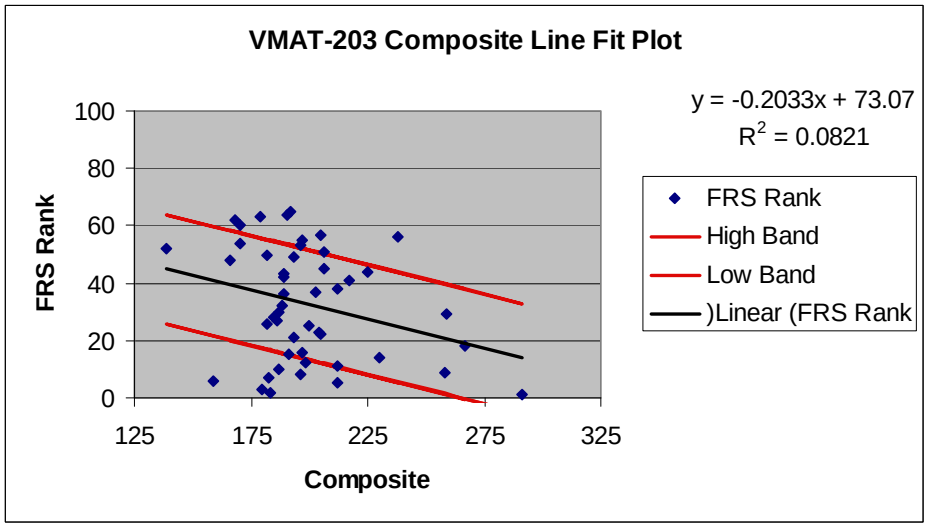
VMAT-203

Squadron Report

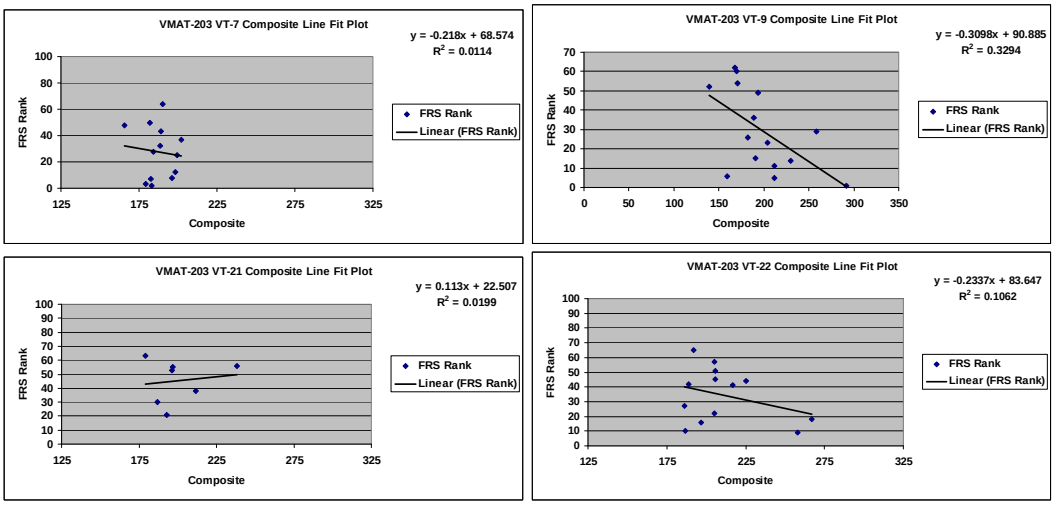
Grade Data. Data was gathered from 66 students from VMAT-203. 48 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.



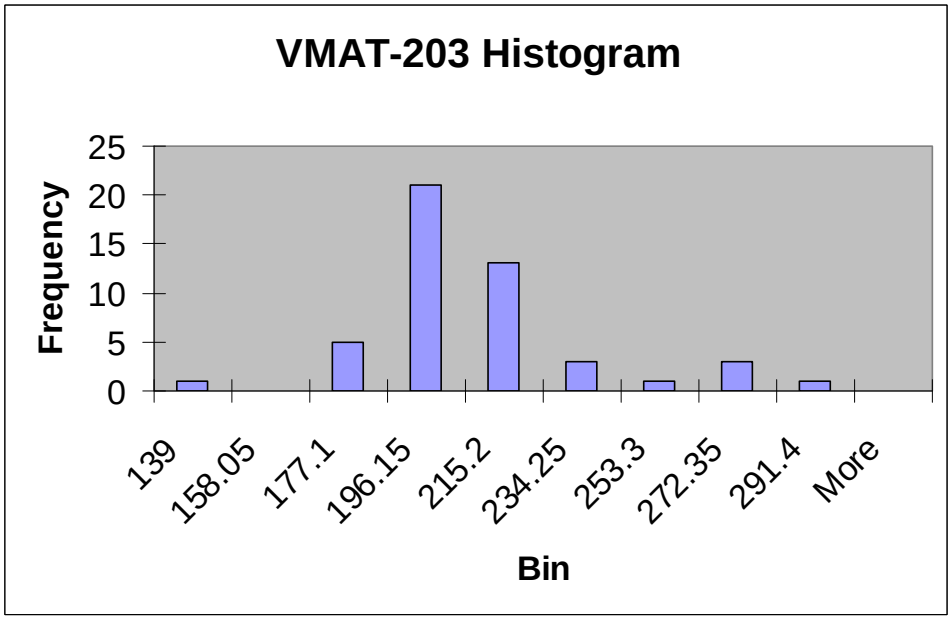
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator. This is the second worst correlation of the seven FRSs studied.



Below are the linear regressions for VMAT-203 broken down by VT squadrons.



A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VMAT-203 had a quality spread that was heavily concentrated in the center, not resembling a bell curve like we see from most squadrons.



Dead End

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-7 sent their 'A-Team' to VMAT-203 and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-7 was better than the rest? Or was it just because VT-7 had 'gamed' the system for the best FRS ranking?

The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-22 sent the highest average composite score to VMAT-203. If the linear regression we ran on the VMAT-203 population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 30.222 upon FRS completion. Their average graduate actually ranked 34.385, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of -4.163. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VMAT-203 are below.

VMAT 203							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	3.034	47.923	187.846	3.359	27.615	34.882	7.266
VT-9	3.035	49.807	198.027	3.347	29.533	32.812	3.279
VT-21	3.030	49.857	200.286	3.263	45.143	32.353	-12.790
VT-22	3.033	52.538	210.769	3.317	34.385	30.222	-4.163
VMAT 203	3.033	50.031	199.232	3.321	34.169	32.567	-1.602

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end. Considering the low r^2 for VMAT-203, assuming an r^2 of 1.0 is too big a leap to make this "Estimated Rank" useful data.

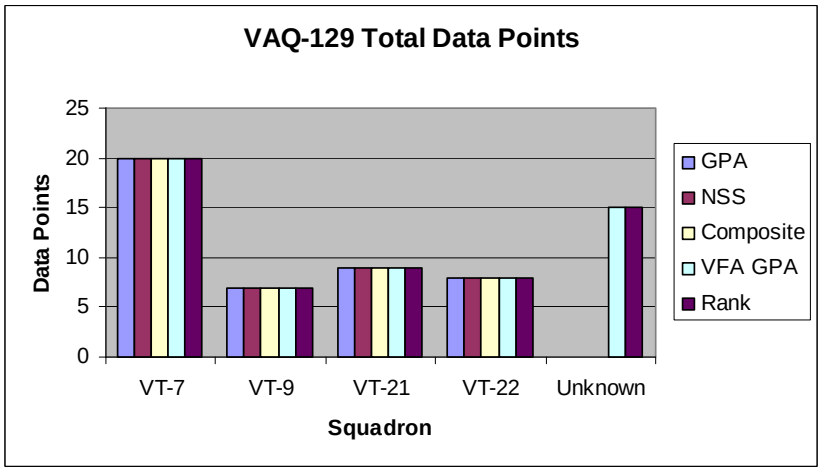
SoD Analysis

VMAT-203 had no SoDs available for analysis.

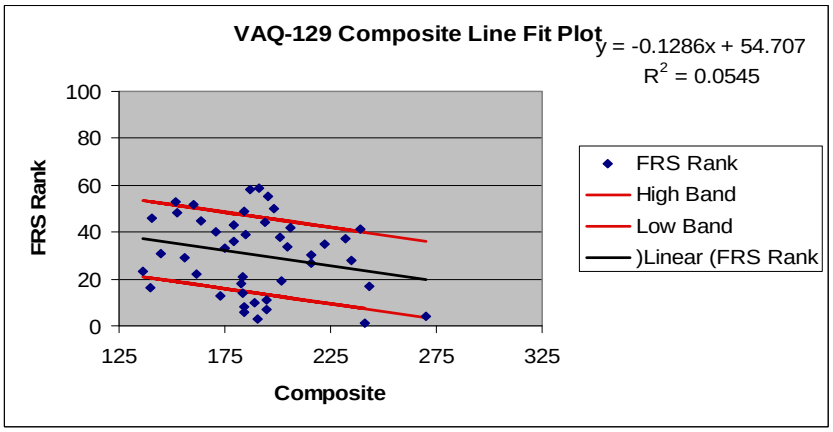
VAQ-129

Squadron Report

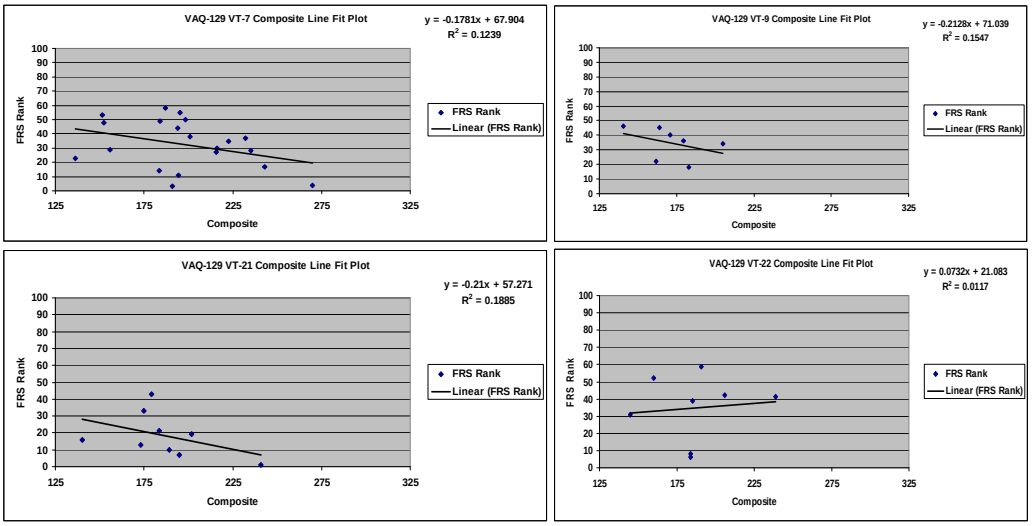
Grade Data. Data was gathered from 59 students from VAQ-129. 44 of the students had the necessary information to be completely analyzed, this included what VT squadron they came from, their composite score, and their FRS rank.



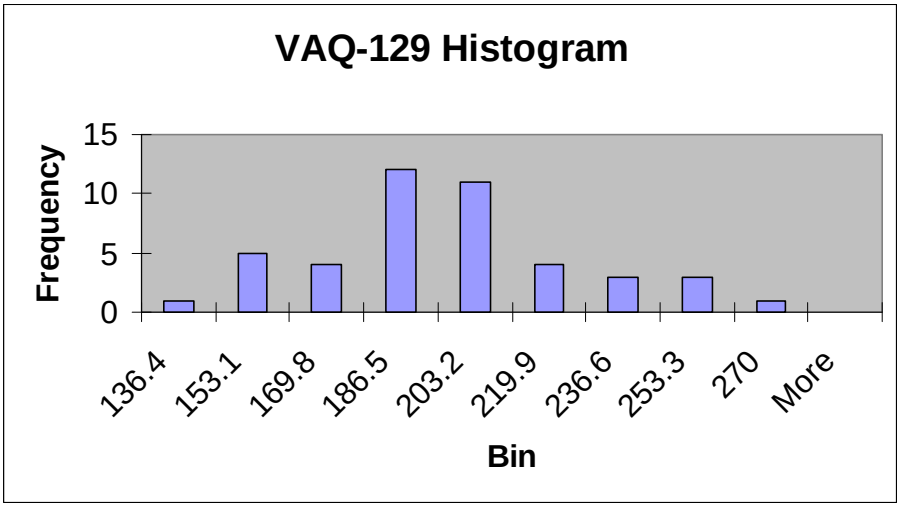
Below is the regression data that was generated by analyzing the student's grades. The linear regression was made by analyzing the student's composite score from the VT and comparing it to the students FRS rank. The red lines, the 'High' and 'Low' bands, are approximately one standard deviation which should encompass 80% of the data gathered. The r^2 value represents a rough correlation to how well the FRS agrees with TG TAC's assessment of the Naval Aviator. This is the worst correlation of the seven FRSs studied.



Below are the linear regressions for VAQ-129 broken down by VT squadrons.



A histogram was used to visually represent the distribution of composite scores of the student entering the FRS. The Histogram was made by taking the entire population of the student's composite scores from the VT and entering them into the graph. The graph shows that VAQ-129 had a quality spread that was heavily concentrated in the center, not resembling a bell curve like we see from most squadrons.



Dead End

A Better VT Ranking? The problem in Phase 1 was to find a squadron ranking which accounted for the different average composite scores sent by each VT squadron. We wanted to know if VT-21 sent their 'A-Team' to VAQ-129 and they ended up graduating with a higher average ranking from the FRS, did that really mean VT-21 was better than the rest? Or was it just because VT-21 had 'gamed' the system for the best FRS ranking?

The solution was a little complicated, but in essence we used the overall linear regression formula to create an 'estimated rank' for FRS completion given the average composite score the VT squadron sent. For example (looking at the table below), VT-7 sent the highest average composite score to VAQ-129. If the linear regression we ran on the VAQ-129 population had an r^2 of 1.0 (perfect correlation), than their average graduate would rank 29.248 upon FRS completion. Their average graduate actually ranked 32.65, however. Subtracting Actual Average Rank from Estimated Rank yielded a VT ranking of -3.402. Doing this for each VT squadron gave four numbers. The biggest positive number (meaning the better they did as opposed to how they were supposed to do given their composite score) showed the best VT squadron *for that FRS*. The results for VAQ-129 are below.

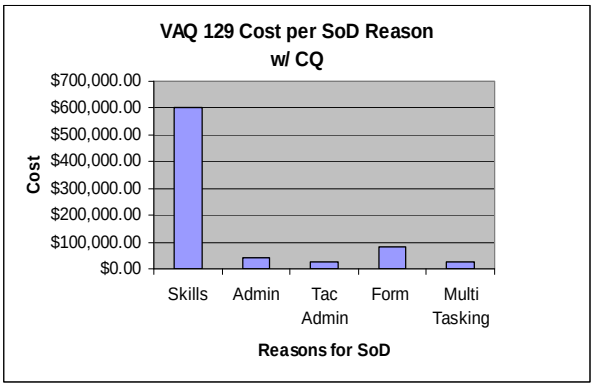
VAQ 129							
VT				VFA			
Squadron	GPA	NSS	Composite	GPA	Average Rank	Estimated Rank	Estimated - Actual
VT-7	3.035	50.250	197.940	3.131	32.650	29.248	-3.402
VT-9	3.032	42.672	172.073	3.133	34.429	32.575	-1.854
VT-21	3.027	46.000	186.453	3.158	18.111	30.725	12.614
VT-22	3.029	46.375	186.750	3.124	34.750	30.687	-4.063
VAQ 129	3.031	46.324	185.804	3.136	29.985	30.809	0.824

Though we didn't know it at the time, we were working with the tightest VT-FRS correlation (r^2) when we started with VFA-122 and VFA-125. The results we found were consistent and held great promise for Phase 2. When we started working with VAQ-129, VMAT-203 and VMFAT-101 the r^2s dropped precipitously, however. Given that the technique made an assumption of a perfect r^2, the Marine and Prowler assumptions became too much to accept. So, while there is something to this technique when r^2s are higher (the results for Navy Hornet FRSs are similar to the VT ranking in the report), this effort ended up being a dead end. Considering the low r^2 for VAQ-129, assuming an r^2 of 1.0 is too big a leap to make this "Estimated Rank" useful data.

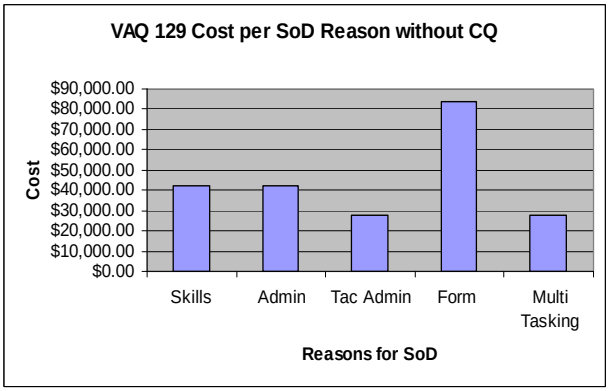
SoD Analysis

VAQ-129 had 17 pilot SoDs and 41 ECMO SoDs. Due to the low amount of pilot SoD data that was obtained from VAQ-129 no in-depth SoD analysis was run for that FRS. The flight SoDs that were analyzed were taken from 1 Oct 2006 to 31 Mar 2008.

VAQ 129	With CQ		
	Flights Required Post SoD		
Reasons	Flights	Flight Hours	Cost
Skills	78	64.50	$602,817.00
Admin	3.00	4.5	$42,057.00
Tac Admin	2	3	$28,038.00
Form	6	9	$84,114.00
Multi Tasking	2	3	$28,038.00
Total EA-6B Required	83.00	81.00	$785,064.00



VAQ 129	WITHOUT CQ		
	Flights Required Post SoD		
Reasons	Flights	Flight Hours	Cost
Skills	3	4.50	$42,057.00
Admin	3.00	4.5	$42,057.00
Tac Admin	2	3	$28,038.00
Form	6	9	$84,114.00
Multi Tasking	2	3	$28,038.00
Total EA-6B Required	8.00	21.00	$224,304.00



Name	Last Four	Class	Date	Event	SoD Reasons						Reason
					Skills	Admin	Tac Admin	Form	Multi Tasking	Remediation	
Bush, P	4026	10-06	02/27/07	PW-WU		X				0	Unable to ID & Execute BF. Unsat knowledge and normal procedures
Bush, P	4026	10-06	02/24/07	PF-10		X				1	Didn't know BF E.P.'s & Brief Prep
Gates, Todd	4960	10-07	01/30/08	CQ	X					Redo	Night CQ, Scan, Line-up
Imperatore	5734	09-06	01/19/07	PF-14				X		1	pace- not keeping up, maneuvering and ALT/Speed Control
Martin, Patrick	1413	05-07	06/07/07	PF-14		X			X	1	Lead pilot skills
Mickelson, Chad	8161	02-07	07/24/07	CQ	X					Redo	Night CQ
Mickelson, Chad	8161	02-07	03/05/07	WB Pilot		X				0	Violated NATOPS
Myers, David	4069	02-07	04/27/07	PF-4	X					1	Landing Performance
Rickert, Kerry	2206	08-07	12/10/07	DQ	X					Redo	DQ
Rock, John	8024	08-07	01/31/08	CQ	X					Redo	Night CQ
Steinbarger, Shaun	6494	10-06	05/31/07	CQ	X					Redo	Night CQ, Boarding rate
Stodola, Jeffrey	6221	10-07	01/31/08	CQ	X					Redo	Tail-strike
Trotter, James	8345	04-07	12/11/07	PF-16			X	X		1	Low level procedures
Warrick, Christopher	1886	03-07	01/15/08	FCLP	X					Redo	Ball Flying
Warrick, Christopher	1886	03-07	09/19/07	PF-21	X					1	Brought back the basket
Warrick, Christopher	1886	03-07	06/06/07	PF-8				X		1	Formation flying, ALT Control
Warrick, Christopher	1886	03-07	05/07/07	PF-3	X					1	Scan breakdown, focusing on one thing. Starts. ALT/AOA control on APP

Grade Analysis Review

The main objective of the grade analysis portion of the project was to see how individuals scored in their respective VT squadrons and compare that score to their overall rank at the FRS. We used the VT composite score compared to the FRS rank to start the comparison. In order to do this, data was collected from all of the VT squadrons and the FRSs. After the raw data was collected the analysis began by sorting the data by VT squadron, then by composite score, so all of the VT squadrons were segregated with the individual with the best composite score at the top of his VT squadron. Next a regression was taken by selecting the regression function out of the data analysis menu. The input Y range for the regression was the FRS rank data, while the input X range was the Composite Score data. Before selecting OK, all of the 'Residuals' boxes located ¾ of the way down the window were selected, as well as the Normal Probability Plots.

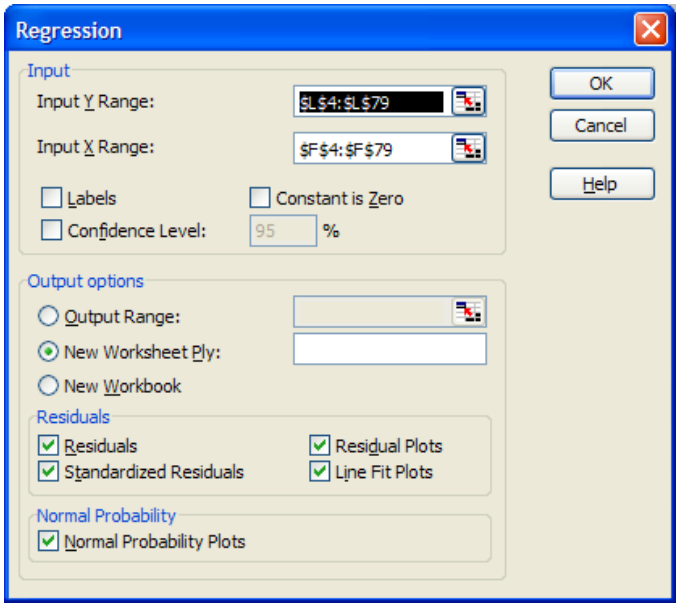


Fig. 1

Once the regression was completed 'High Band' and 'Low Band' columns were added, as well as changing the title of the 'Predicted Y' column to 'Predicted Rank.' The 'High Band' column was calculated by adding the 'standard error' value, located in the 'regression statistics' box (approximately cell A7), to the 'Predicted Rank' value. The 'Low Band' column was calculated by subtracting the 'standard error' value from the 'Predicted Rank' value.

The next step was to calculate the predicted rank for each VT squadron. This was accomplished by averaging the 'Predicted Rank' data, highlighted in yellow, from each VT squadron. Each of the observations correlates with the individuals from the original data. So in the example Mello, Brian(Fig. 3) would be observation 1, and we can continue down the list and correlate each name with the observation. Continuing with the example if VT-22 had ten individuals and they were the first cells of data from the original source data then we would average the predicted rank of 'Observations' one through ten. This would give us the average predicted rank for VT-22. Next, calculations were made to get the average FRS rank from each VT squadron. In the example the average FRS rank, for VT-22 would be calculated by taking the sum of all ten FRS ranks, in blue, then dividing that number by ten. Finally, a comparison was made between the average predicted rank from the regression data, and the average actual rank from the FRS. Figure 4 shows that VT-22 had an estimated rank of 36.48, but the actual rank was 39.89. This shows, that on average, the members from VT-22 ranked 3.4 places lower then predicted.

Note: calculations were made to get a percentile rank from the FRS rank. This was achieved by subtracting one from the quantity of the FRS rank, highlighted in blue, by the total number of individuals in the squadron, in our case ten. The equation would look like: 1-(FRS Rank/Sum of VT-22 students). The reason why the equation had to be subtracted by one, was so that the highest percentile rank would correlate with the best FRS rank.

Observation	*Predicted Rank*	*High Band*	*Low Band*
1	28.40462676	47.64978593	9.159467597
2	22.08040831	41.32556748	2.835249146
3	48.43131853	67.6764777	29.18615936
4	34.99235432	54.23751349	15.74719515
5	19.9723355	39.21749466	0.727176328
6	13.38460794	32.62976711	-5.860551226
7	36.30989983	55.555059	17.06474066
8	41.58008187	60.82524104	22.33492271
9	36.30989983	55.555059	17.06474066
10	46.58675481	65.83191398	27.34159565

Fig. 2 (Regression Data)

		VT Grades		VFA 106 Grades		
Last Name	**First Name**	**Squadron**	**Composite**	**RANK**	**PERCENTILE RANK**	**VFA GPA**
MELLO	BRIAN	22	243	3	96.05%	3.083885783
RENEAU	JABARI	22	267	5	93.42%	3.078610849
HOOD	DOUGLAS	22	167	10	86.84%	3.067064226
WARD	EDWARD	22	218	18	76.32%	3.061169681
MCINTOSH	BRIAN	22	275	20	73.68%	3.058934397
CORDILL	BRANDON	22	300	29	61.84%	3.052893889
BINES	BENJAMIN	22	213	32	57.89%	3.047901633
DALTON	CASEY	22	193	33	56.58%	3.047647179
ECKHART	STEPHEN	22	213	41	46.05%	3.043138978
GUZMAN	JOHN	22	174	45	40.79%	3.042361377

Fig. 3 (Original Data)

VFA 106 C/D							
VT				VFA			
Squadron	**GPA**	**NSS**	**Composite**	**GPA**	**Average Rank**	**Estimated Rank**	**Estimated - Actual**
VT-7	NA	NA	220.1	3.03951	39.07	34.43522079	-4.64
VT-9	NA	NA	181.3	3.04053	40.64	44.66058682	4.02
VT-21	NA	NA	216.8	3.04996	33.95	35.29747012	1.35
VT-22	NA	NA	212.3	3.04052	39.89	36.48557256	-3.40
VFA 106 C/D	NA	NA	204.7	3.04270	38.50	38.5	0.00

Fig. 4 (Summary Data)

A composite line fit graph was used to compare the FRS rank directly to the VT composite score. The data was plotted by using three series of data: 'FRS Rank,' 'High Band,' and 'Low Band' (see Fig. 5). The series 'FRS Rank' compared the composite scores (X Values) with the FRS rank (Y Values) as shown below. The series 'High Band' compared the composite scores (X Values) with the 'High Band' (Y Values). The series 'Low Band' compared the composite scores (X Values) with the 'Low Band' (Y Values). The graphed High Band and Low Band data was formatted to be uniform with one another. Both were colored red, and edited to be a line rather then individual data points. This can be done by right clicking on one of the data points from the high band or low band and selecting 'Format Data Series' from the menu.

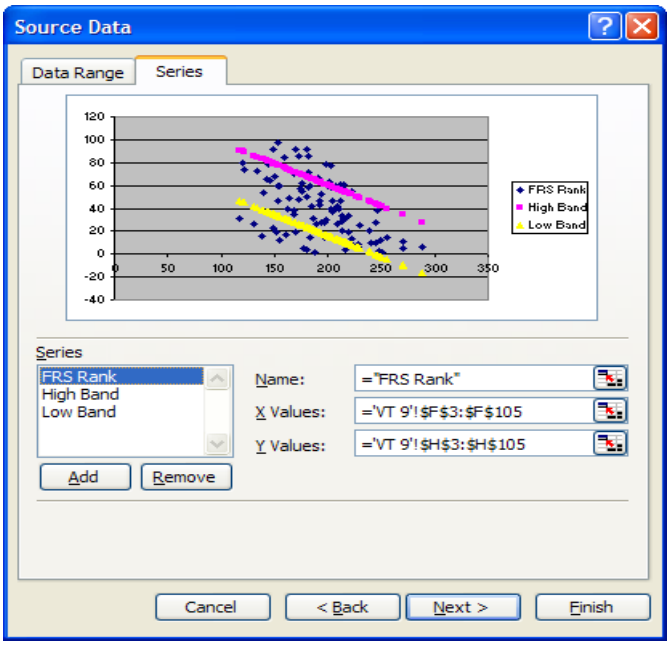


Fig. 5 (plotting the data)

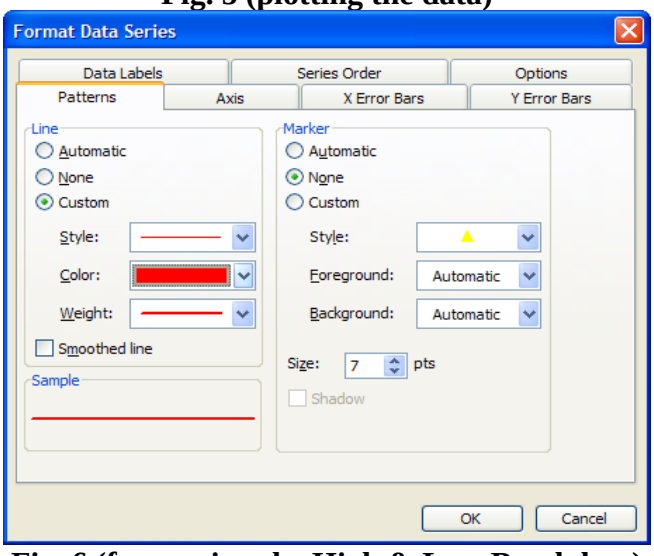


Fig. 6 (formatting the High & Low Band data)

With the data points plotted the addition of a trend line (black) was added to give a visual representation of the median of the data. To add the trend line right click on one of the data points, select add trend line and, base the series on the FRS Rank data. Also, select options and then check the boxes: 'display equation on chart' and 'Display R-squared value on chart'. The R^2 equation and value can be found in the upper right hand corner of the graph. The R^2 value tells us to what degree of certainty we can say the trend line truly describes the trend in the data. This in turn gives a predictor of how well the VT squadrons grading can predict how the student will do at the FRS.

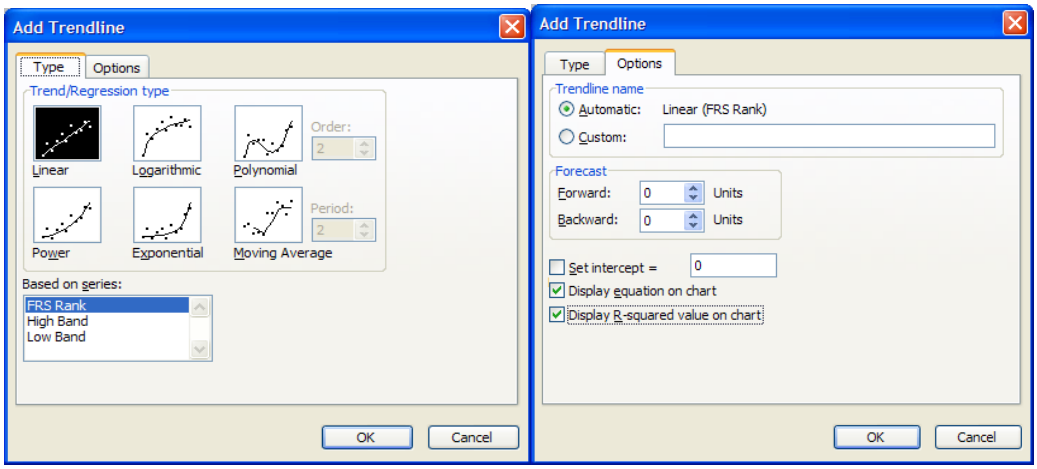


Fig. 7 (addition of a trendline steps 1 & 2)

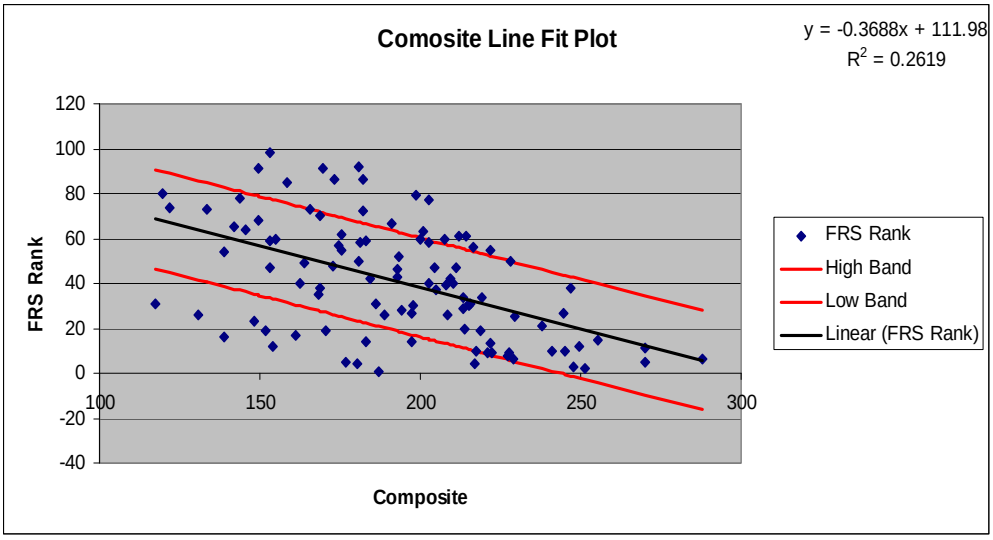


Fig. 8

The next graph was a histogram which graphed the VT composite scores of all of the individuals. The desired affect was to determine how the grading curve looked for the VT squadrons, and overall with all squadrons included in one graph. In order to do this the data was separated by what squadron the individual came from and what their composite score was. With that information we ranked the individuals, with 1 being the highest composite score, and the lowest number correlating with the lowest composite score. Next the data was put into bins, this is a way to determine how many 'bars' on the graph there will be. This was determined by taking the highest composite score and subtracting it from the lowest composite score. This yielded the 'comp delta' value, which was then divided by a factor of eight, to give us a reasonable increment to increase the bins by. The bins started with the lowest score, then we added the increment value, as previously described, until we reached a high enough number that encompassed the entire spread of data. Once that was finished, the histogram was graphed by selecting the 'data analysis' tab out of the Tools toolbar and selecting 'Histogram' from the pull down menu (see Fig. 9). The input range was established by selecting all of the composite scores, and the bin range was the nine numbers that covered the entire spread of the composite score data. The result will yield the number of data points in the given bin range, labeled 'frequency' as well as the histogram graph itself.

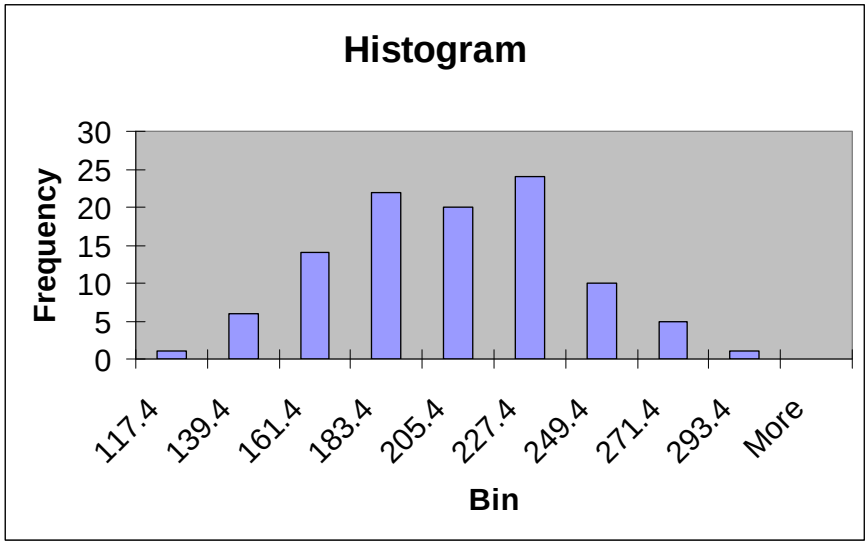


Fig. 9

Bin	*Frequency*
117.4	1
139.4	6
161.4	14
183.4	22
205.4	20
227.4	24
249.4	10
271.4	5
293.4	1
More	0

Fig. 10

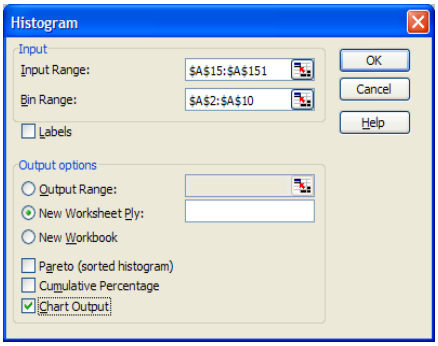


Fig. 11

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SoD Analysis Review

The SoDs were compiled in coordination with each FRS, but unfortunately there was only enough usable data to analyze the SoDs from VFA 106 C/D, VFA 122, and VFA 125. Each individual SoD was broken down to determine the cause of difficulty (skills, admin., multi-tasking, formation, and tac admin), how many F-18's were used for the extra training flights, and in what phase of training the SoD occurred. The number of F-18's that were required for extra training was determined by using the syllabus information from the FRS. Then, the total number of F-18's needed was evenly distributed to the reason(s) causing the SoD. The next step was to break down the SoDs by the reason causing the SoD. If a SoD had multiple reasons behind it the cumulative total could only be 1, so the reasons had to be broken into fractions of a SoD. Below is an example of how the analysis was done. Looking at the data highlighted in yellow we can see that the individual SoD required six F-18's to be used for extra training. The reason for the SoD was Skills, Admin., and Formation, so 2 F-18's were allotted for each of those reasons. And the reason for the 1 SoD was 0.33 Skills, 0.33 Admin., and 0.34 Formation.

			What Caused the SoD						What Caused the SoD				
Parent _phase	**ET**	**Total F/A-18**	**Skills**	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**		**Skills**	**Admin**	**Multi Tasking**	**Formation**	**Tac Admin**
AWI	yes	2	1	1					0.5	0.5			
AWI	yes	6	2	2		2			0.33	0.33		0.34	
AWI	yes	3				3						1	
AWI	no	3				3						1	
AWI	yes	3	1.5	1.5					0.5	0.5			
		17	**4.5**	**4.5**	**0**	**8**	**0**		**1.33**	**1.33**	**0**	**2.34**	**0**
			$44,167.66	$44,167.66	$0.00	$78,520.28	$0.00						

Fig. 1

Once the data was broken down the totals were tallied (highlighted in green). Following this the total cost figure could be calculated for the extra training required for that specific phase. This was accomplished by taking the total cost to fly the aircraft per hour, multiplied by the number of hours for a training flight, multiplied by the total number of F-18's used. The resulting number gives the total cost per phase broken down by reason for the extra training awarded. Once this was completed for each phase of training the totals could be put into a table to get the big picture of where the majority of the costs were coming from, over the given time period. So in AWI, SoDs attributed to formation errors cost the Navy $78,520.28.

VFA 106 C/D Cost per Reason With CQ

	Skills	Admin	Multi Tasking	Formation	Tac Admin
AWI	44,167.66	44,167.66	0.00	78,520.28	0.00
FAM/FRM	88,335.32	93,242.83	4,907.52	255,190.92	0.00
LAT	0.00	0.00	0.00	58,890.21	0.00
STK	53,982.69	14,722.55	364,628.56	70,373.80	320,559.05
IFR	0.00	24,537.59	0.00	14,722.55	0.00
BFM	350,004.16	49,075.18	183,148.56	39,260.14	45,738.06
FWT	19,630.07	19,630.07	150,464.49	52,314.14	189,822.78
SRA	9,815.04	49,075.18	68,705.25	98,150.35	98,150.35
CQ	4,253,181.92	65,433.57	0.00	0.00	0.00
Total	4,819,116.85	359,884.62	771,854.37	667,422.39	654,270.25

Fig. 2

The data was then broken down further to include the average yearly and quarterly costs as well as the average SoDs per year and per quarter. This was accomplished by taking the total number of months the SoD data was gathered from and dividing that number by three. This gave the number of quarters from which the data was gathered. From there we were able to calculate the number of years by dividing the total number of quarters by four.

VFA 106 C/D Cost per Year With CQ

	Skills	Admin	Multi Tasking	Formation	Tac Admin
Total	596,179.40	44,521.81	95,487.14	82,567.72	80,940.65
CQ	526,166.84	8,094.87	0.00	0.00	0.00
AWI	5,464.04	5,464.04	0.00	9,713.85	0.00
FAM/FRM	10,928.08	11,535.20	607.12	31,570.01	0.00
LAT	0.00	0.00	0.00	7,285.39	0.00
STK	6,678.27	1,821.35	45,108.69	8,706.04	39,656.79
IFR	0.00	3,035.58	0.00	1,821.35	0.00
BFM	43,299.48	6,071.16	22,657.55	4,856.92	5,658.32
FWT	2,428.46	2,428.46	18,614.16	6,471.85	23,483.23
SRA	1,214.23	6,071.16	8,499.62	12,142.31	12,142.31

Fig. 4

VFA-106 Data from MAR 2000 to NOV 2008 With CQ	
Total Months	97
# QRT	32.33
# Years	8.08
Total Cost	7,272,548.48
Cost / Year	$899,696.72
Cost/ QRT	$27,825.67

Fig. 5

After the data was broken down by years and quarters we were able to graph the data to get a visual representation of the tables. The graph used is a 3D column graph, used to compare the costs, reasons, and phases of flight. In order to make the graph more readable the 'Total' column and 'CQ' column in the charts were rearranged to be read first on the graph and therefore not block out other, smaller bars on the graph. Also note that the analysis was ran with and without CQ because of the large number of training flights required for a CQ disqualification. To re-fly the CQ phase required an additional

20 flights at .8 hours per flight, compared to one normal syllabus flight of 1.2 to 1.5 hours (depending on aircraft model).

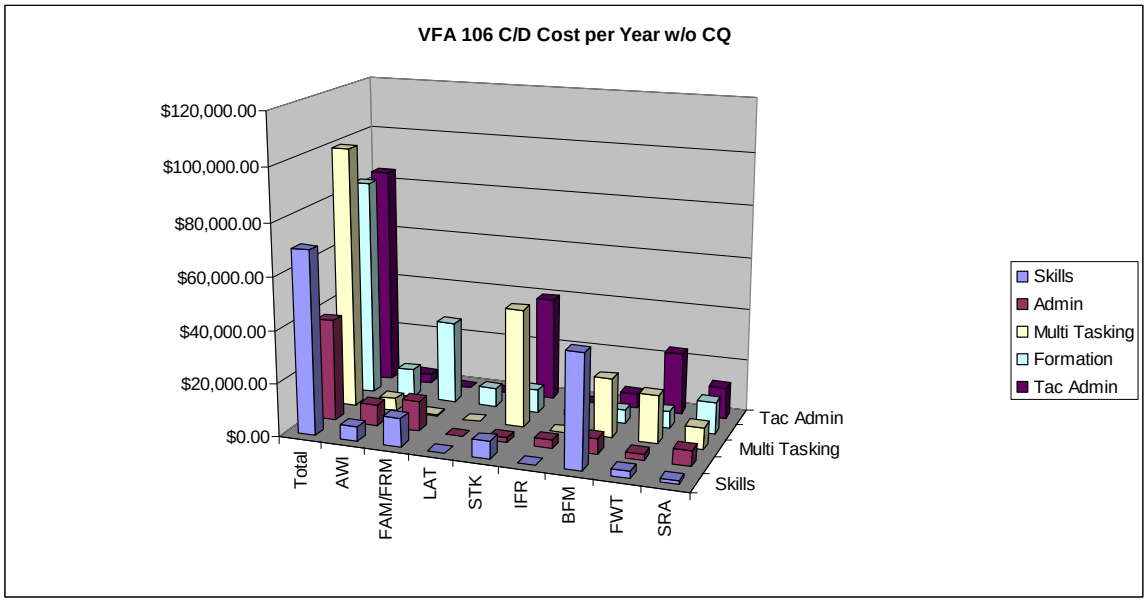

Fig. 6

The data was analyzed the same way for each FRS, and after the analysis was complete the charts were combined in an easy to read workbook. Some flights in the syllabus required the use of F-5's, so in order to re-fly these flights we had to incorporate the cost per hour of the F-5 and the duration of their flight, $2659 and 1.1 hrs/flight respectively.