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Effect of Manpower Policy Changes on Retention and Promotions in the U.S. Marine Corps

Jon Swanson, Master Sergeant USMC, Inventory and Requirements Chief,

HQMC, Manpower and Reserve Affairs

ABSTRACT

This analysis was conducted to advise and assist executive decision makers on possible effects on policy changes that would affect enlisted promotions and retention in the U.S. Marine Corps. On an annual basis the Marine Corps retains less than 30% of Marines on their initial contract. In some cases this can create gaps in manpower and readiness when Marines in certain occupational specialties are promoted the rank of E5 prior to the end of their initial contract. In fiscal year 18 approximately 30% of Marines who exited after their initial contract (48 months) reached the grade of E5 prior to exiting active service. The proposed policy change would not allow promotion to E5 prior to reaching 48 months of service in order to prevent this potential gap in manpower in specific occupational fields. What this led to in relation to this study was an in depth look into different occupational specialties and all enlisted ranks in regards to future manpower planning decisions. We used various SAS® procedures and techniques along with other statistical analysis practices in the context of the Marine Corps to see where we could be affected by this policy change. Also, an in depth look into promotion rates which can affect the ability for Marine to complete required training prior to be considered for future advancement.

INTRODUCTION

The Marine Corps as a whole has over 200,000 Marine between active duty and reserve service on a daily basis. Many challenges are faced on a regular basis to keep quality Marine in a capacity of service vice losing them to the private sector. The scope of this paper focuses on an analytical problem solving approach to resolving issues faced by different manpower related policies across the Marine Corps that affect the enlisted population. About 3 years ago I began an ongoing study into some of the impacts new and existing policies have on manpower in regards to retention and promotion in the Marine Corps Reserves. This paper will outline some of the techniques used within SAS to help analyze these problems from an analytical perspective while also providing data for decision makers. This paper will specifically look into source code of multiple different SAS programs aimed at providing data for further research an analyzation. The output data in this paper is notional and does not reflect any personal identifiable information of any individual Marines.

TRACKING TRAINING COMPLETION REQUIREMENTS

This section covers an area of research where we use historical data that is compiled monthly. We first build a base file from a source database to speed up further processing. Also the initial portion of this is where a new variable is created to help with designation of Occupational Field. The first two digits of an Occupational Field designate the specific field related to a grouping of Military Occupational Specialties (MOS). This allows for break outs within the outputs of data to identify trends by rank and Primary Military Occupational Specialty (PMOS) as seen in Figure 2.

Figure 3 uses the School Completion Code variable to create a new variable that remains a constant for different logical equations. In this example there are three different if/then equations that could calculate outcomes meaning a Marine has met the training requirement vice having three digit codes.

Figure 1. A date function is used as a constant for calculations later in the program:

```
DATA DATE_FUNCTIONS;
      LENGTH DAY $8.;
      Month = UPCASE(put (today(),monname3.));
      day = TRIM(LEFT(%sysfunc(putn(%sysfunc(today()),yymmddn8.))));
      year = TRIM(LEFT(year(today())));
      date = LEFT(day(today()));
      today = TRIM(date)||" "||month||""||year;
      CALL SYMPUT ("MMM", Month);
      CALL SYMPUT ("YYYYMMDD", day);
      CALL SYMPUT ("TDATE", today);
RUN;
```

ADDING VARIABLES FOR DATA CLEANSING

Figure 2. Create New Variable for Occupational Field:

```
DATA E5_POP_TFDW;
SET TFDW.MARINE1; /*PULLED FROM TFDW AFTER MONTHLY SEQUENCE POSTS*/
WHERE SEQ_NUMBER = &SEQ_NUMBER. AND DOD_TRAIN_CATEGORY_PAY_GROUP IN
('XX','XX') AND PRESENT_GRADE_CODE IN ('E5');
KEEP LAST_NAME FIRST_NAME SSN OCCFIELD
IF RESERVE_MONITORED_COMMAND_CODE = 'RET' THEN DELETE;
IF RESERVE_REPORTING_UNIT_CODE = 00000 THEN DELETE;
IF PRIMARY_MOS_CODE = '8011' THEN DELETE;
      IF SUBSTR(PRIMARY_MOS_CODE,1,2) = '01' THEN OCCFIELD = '01XX';
      IF SUBSTR(PRIMARY_MOS_CODE,1,2) = '02' THEN OCCFIELD = '02XX';
      IF SUBSTR(PRIMARY_MOS_CODE,1,2) = '03' THEN OCCFIELD = '03XX';
RENAME ELECTRONIC_INTRCHG_PERSON_ID = EDIPI RESERVE_MONITORED_COMMAND_CODE =
RESMCC RESERVE_REPORTING_UNIT_CODE = RESRUC;
```

```
RUN;
```

Figure 3. Adding Variable for School Completion:

```
DATA PME5_TFDW;
      SET PME3_TFDW;
      IF SGT_NONRES = 'XXX' AND SGT_RC_RES = 'AAA' THEN COMPLETE = 'YES';
      IF SGT_NONRES = 'YYY' AND SGT_RC_RES = 'BBB' THEN COMPLETE = 'YES';
      IF SGT_NONRES = 'ZZZ' AND SGT_RC_RES = 'CCC' THEN COMPLETE = 'YES';
      DROP SGT_NONRES_COMP SGT_RC_RES_COMP;
RUN;
```

COMPILING DATA FOR FINAL ANALYSIS AND TABLE CREATION

The use of the Proc Means, Proc Freq and ODS Output's will conclude this section. The first calculation created a table using the Proc Means function which will reference the previous "Date Function" to calculate the average "Time in Grade" of Marine in a specific PMOS. This output can help decision makers plan for future requirements related to retention and promotion. For the purpose of this paper these functions are displayed to provide a varying perspective of processing data.

Figure 4. Proc Means source code to calculate average Time in Grade:

```
PROC MEANS DATA = TIG_E5;
   WHERE RESGRPTXT = 'SMCR';
   CLASS PRESGRD PMOS;
   VAR TIG;
   OUTPUT OUT=SMCR_TIG_AVG MEAN=  / AUTONAME AUTOLABEL;
RUN;
```

Present Grade Code	PMOS	N Obs	Mean	Std Dev	Minimum	Maximum
E5	0111	100	24	16	1	75
	0211	200	40	16	15	34

Table 1 Proc Means Procedure to calculate and display an average of the Time in Grade variable

Using ODS PDF output for reference

Using the ODS PDF Output function created a display output for the calculations of an arithmetic function used in SAS (Table 2). This visual table provides a formatted and viewable display for use as a reference in outside sources or programs. Figure 5 is the source code that creates the base of the table:

Figure 5.

```
DATA E5_TFDW_MERGE;
FORMAT MSC PRESENT_GRADE_CODE COMPLETE_ COUNT COMPLETE_PERCENT;
FORMAT COMPLETE_PERCENT PERCENT.;
MERGE E5_MSC (IN = A) E5_PME_STAT (IN = B);
BY MSC PRESENT_GRADE_CODE;
IF COMPLETE_ = . THEN COMPLETE_ = 0;
COMPLETE_PERCENT = COMPLETE_/COUNT;
DROP PERCENT COMPLETE;
RUN;
```

Figure 6. ODS PDF OUTPUT:

```
ODS PDF FILE ="FILE DESTINATION..PDF";
```

```
PROC PRINT DATA = E5_TFDW_MERGE;
      TITLE "TITLE";
      RUN;
ODS PDF CLOSE;
```

MSC	Present Grade	Complete	Count	Comp %
AAA	E5	25	100	25%
BBB	E5	50	100	50%

Table 2 Display of calculation listed in Figure 5 using ODS PDF output

DEFINING NEW VARIABLE WITH DATES AND FUNCTIONS

This section uses the creation of the "TDATE" variable to define the date that you want to use as a reference point for future calculations. In this case, we define "TDATE" in SAS Date format for the current date we are running the report. The purpose of this report is to calculate different variables that can assist in decision making in regards to manpower policies that could affect manpower within the Marine Corps Reserves. The following definitions are provided to give an understanding of what will follow in the source code:

1. Time in Grade (TIG): The computation of the total months in grade includes the number of months in the present grade on the current enlistment to the designated cutoff date and the TIG in the current of higher grade from a previous enlistment.
2. Time in Service (TIS): The number to be used is the total months in service.
3. TIS_2_GRD: created in the source code to calculate the TIS until the designated date of current rank.

In this case the TIS-2_GRD variable is created to specifically define how much service (months/years) a Marine had when they were promoted to their current grade. This varies for every Marine, but allows for mean calculations further in the program.

TDATE Source Code

The TDATE variable is the current date of the report in SAS Date format:

Figure 6.

```
DATA TIS (KEEP = SSN DODTCPG PRESGRD AFADBD PEBD DOR OCCFLD PMOS TDAY);
      SET SOURCE.TABLE (RENAME = (DOD_TRAIN_CATEGORY_PAY_GROUP = DODTCPG
PRESENT_GRADE_CODE = PRESGRD PRESENT_GRADE_EFFECTIVE_DATE = DOR
PRIMARY_MOS_CODE = PMOS PAY_ENTRY_BASE_DATE = PEBD));
      WHERE PRESGRD IN ('E4','E5','E6','E7','E8','E9');
      OCCFLD = SUBSTR(PMOS,1,2);
      IF SUBSTR(PMOS,3,2) = '00' THEN DELETE;
      TDAY= 21822;
RUN;
      PROC SORT;
            BY SSN;
      RUN;
```

Create a data step to calculate variables for future use

Using the source code from Figure 6, we create a new data step that will create the calculations of the needed variables. These calculation will define data for each observation (TIG, TIS, TIS_2_grd) which can be used for individual use or to group variables by larger data points (i.e. Occ Field, PMOS). Below is the source code of the TIS calculations:

Figure 7.

```
DATA TIS_CALC;
SET TIS; TIG = INTCK('MONTH', DATEPART(DOR), TDAY);
/*DEFINE TIG METRIC IN MONTHS*/
TIS = INTCK('MONTH', DATEPART(PEBD), TDAY);
/*DEFINE TIS METRIC IN MONTHS*/
TIS_2_GRD = INTCK('MONTH',DATEPART(PEBD), DATEPART(DOR));
/*DEFINE TIS UNTIL SPECIFIC GRADE IN MONTHS*/
TIG_YEARS = TIG /12.;
/*DEFINE TIG IN YEARS BY DIVIDING TOTAL MONTHS BY 12*/
TIS_YEARS = TIS / 12.;
/*DEFINE TIS IN YEARS BY DIVIDING TOTAL MONTHS BY 12*/
TIS_2_GRD_YRS = TIS_2_GRD / 12.;
/*DEFINE TIS IN YEARS TO CURRENT GRADE, DIVIDING TOTAL MONTHS BY 12*/
DROP SSN;
RUN;

PROC SORT;
      BY TIS;
      RUN;
```

USING FUNCTIONS TO DRIVE VISUALIZATION

Using the PROC MEANS procedure to calculate necessary variables

The PROC MEANS procedure in this case calculates the total count of observations, minimum and maximum metrics for the different associated variables. This allows us to further compare statistics by Occ Field, specific PMOS within an Occ Field or a breakdown of all PMOS's within a certain rank. This data step is shown in the below source code:

Figure 8.

```
PROC MEANS DATA = TIS_CALC;
   CLASS PRESGRD PMOS;
   VAR TIS TIG TIS_2_GRD TIS_YEARS TIG_YEARS TIS_2_GRD_YRS;
   OUTPUT OUT=TIS_PMOS_ALL MEAN=  / AUTONAME AUTOLABEL;
RUN;
```

Output into a table that can be exported into excel as a table or raw data is also an important function we use to further analyze the data we have gathered. A notional output of the Proc Means step used in table 8 is listed below:

Present Grade	PMOS	N Obs	Variable	Mean	Minimum	Maximum
E10	9999	200	TIS	71	27	122
			TIG	27	2	91
			TIS_2_GRD	44	17	106
			TIS_YEARS	6	2	10
			TIG_YEARS	2	.5	7
			TIS_2_GRD_YEARS	4	1.2	8

Present Grade	PMOS	N Obs	Variable	Mean	Minimum	Maximum
	8888	500	TIS	68	43	132
			TIG	21	2	71
			TIS_2_GRD	47	20	11
			TIS_YEARS	5	3	4
			TIG_YEARS	2	.1	.6
			TIS_2_GRD_YEARS	4	2	.8

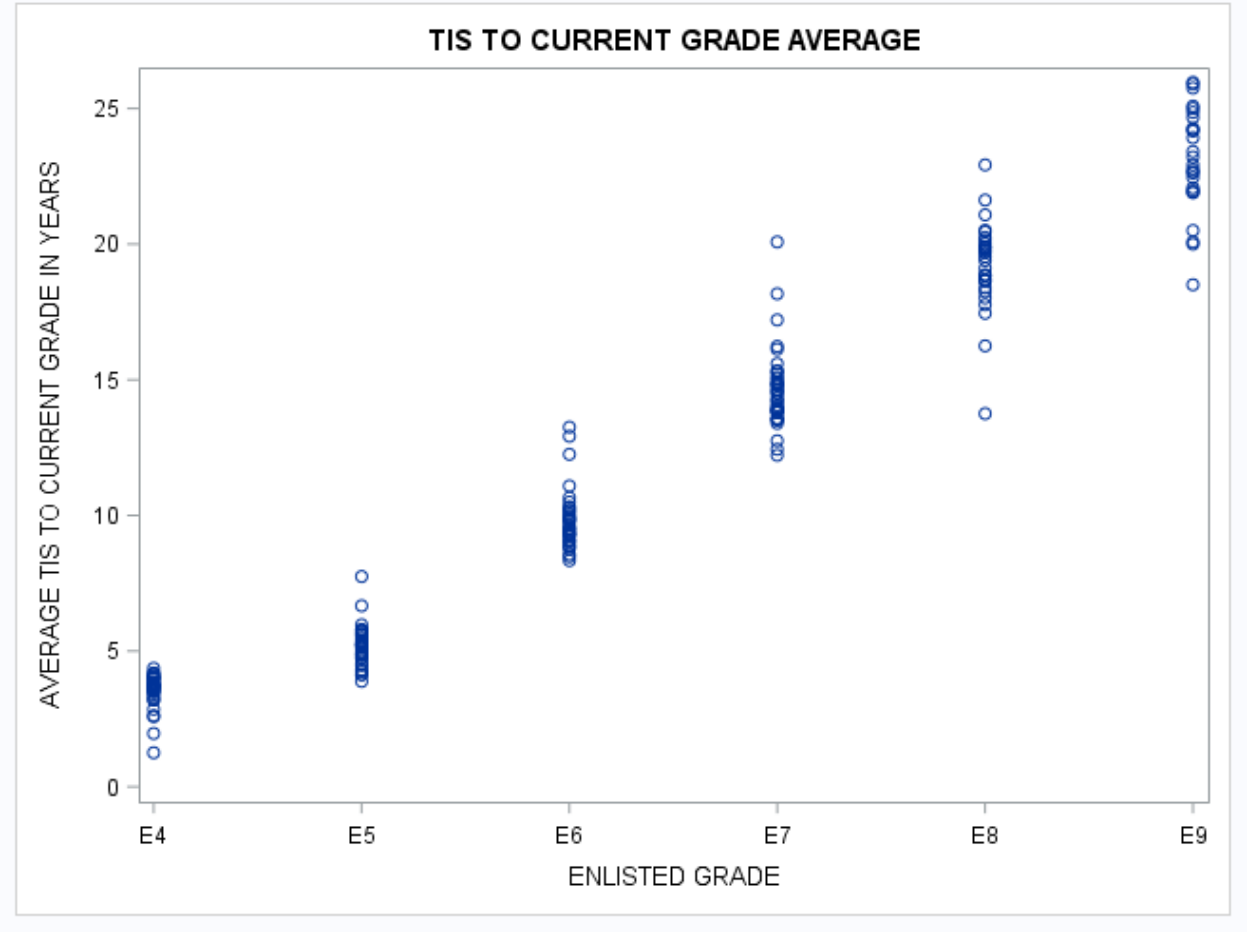
Using the SG PLOT procedure for visualization

Using the SGPLOT procedure a visual display can be used as another method to provide data for decision makers. The below source code and output are provided as an example:

Figure 9.

```
PROC SGPLOT DATA = TIS_PMOS_ALL;
TITLE 'TIS TO CURRENT GRADE AVERAGE'; /*TIS TO CURRENT GRADE AVERAGE*/
SERIES X=PRESGRD Y=TIS_2_GRD_YRS_MEAN /lineattrs=(color=gold thickness=0)
MARKERS;
XAXIS DISPLAY = (NOLABEL);
YAXIS DISPLAY =(NOLABEL);
XAXIS LABEL = 'ENLISTED GRADE';
YAXIS LABEL = 'AVERAGE TIS TO CURRENT GRADE IN YEARS';
RUN;
```

Figure 10.

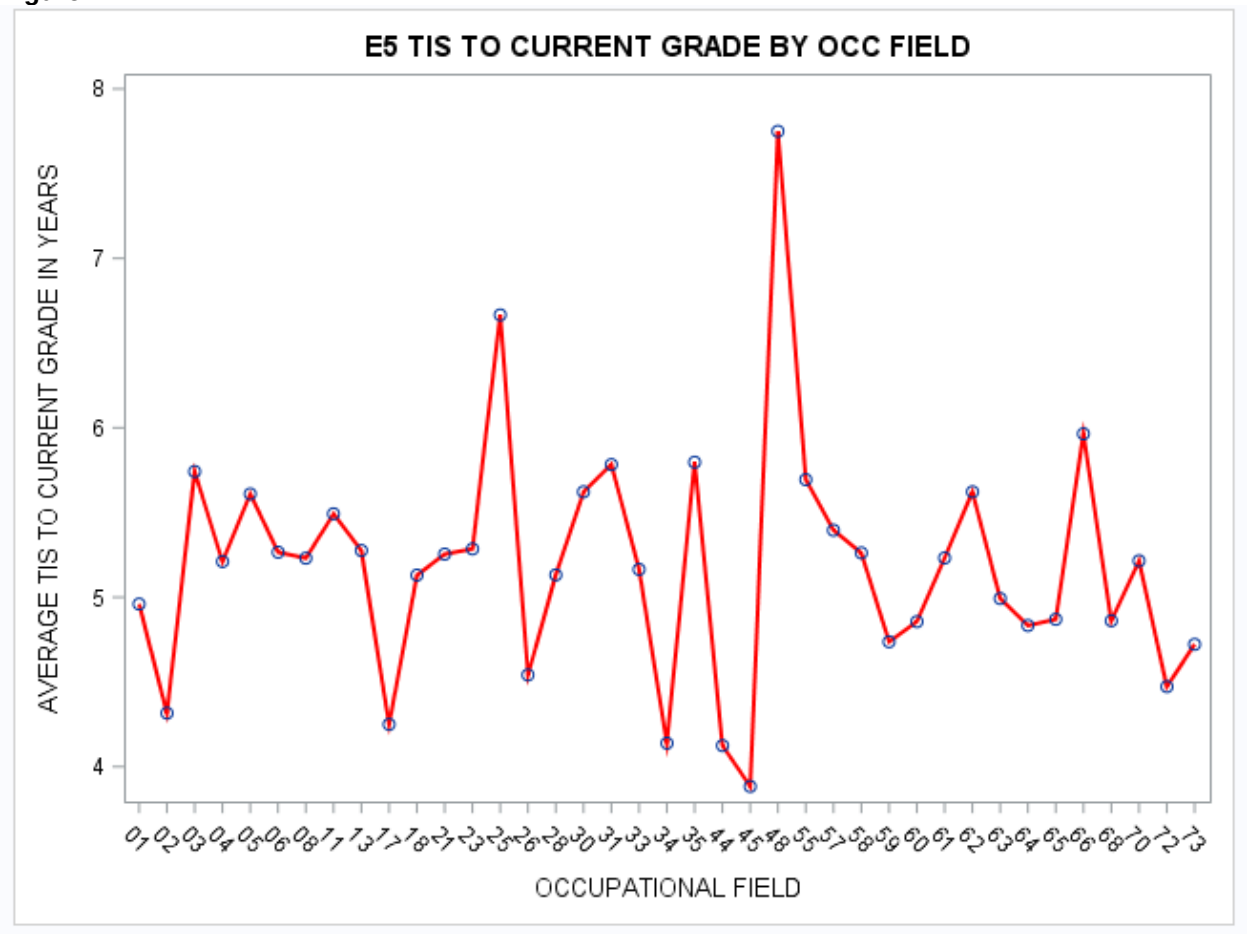


This output provides a visual display of a constant (X Axis) per Grade and variable year using the Y axis. Varying symbols and adding or removing constants can help expand or slim down the pool of data you are trying to present to. In this case the data presented helps display outliers in years of service to a specific grade. Also, the display aides in the visualization of more densely populated variables.

Figure 11.

```
PROC SGPLOT DATA = TOTAL_E5;
TITLE 'E5 TIS TO CURRENT GRADE BY OCC FIELD'; /*E5 TIS TO CURRENT GRADE BY
OCC FIELD*/
SERIES X=OCCFLD Y=TIS_2_GRD_YRS_MEAN /lineattrs=(color=RED thickness=2)
MARKERS;
XAXIS DISPLAY =(NOLABEL);
YAXIS DISPLAY =(NOLABEL);
XAXIS LABEL = 'OCCUPATIONAL FIELD';
YAXIS LABEL = 'AVERAGE TIS TO CURRENT GRADE IN YEARS';
RUN;
```

Figure 12.



The display of this output is refined to a specific grade (rank) across multiple different occupational fields. A linear display has been added as a feature to highlight the larger differences between the variable in the Y Axis and different fields displayed in the X axis.

Using the SG PLOT procedure for visualization

Figures 10 and 12 are displays that provide data on the larger end of the researched spectrum. The intent of this display method is to provide a visualization of a product that can be scaled back in increments as an aide in decision making.

CONCLUSION

The use of different visualization techniques and arithmetic functions powered by SAS were intricate in the ongoing research and problem solving outlined in this paper. This paper has been written using a context that the Marine Corps uses to drive manpower policy decisions. The use of Base SAS to provide analytical leverage to otherwise very complex and labor intensive problems is something I feel is relatable across many varying professions. The research used as case studies in this paper has provided analysis for real time manpower decision that affects thousands of currently serving service members and the potential to affect future members as well. Due to the ongoing analysis initiated through the techniques used in this paper executives within major departments of the Marine Corps have been able to alter behavior and culture in a positive way to positively affect manpower readiness and retention in the future.

RECOMMENDED READING

- *Base SAS® Procedures Guide*

- *SAS® For Dummies®*
- *SAS/GRAPH 9.2 Statistical Graphics Procedures Guide Second Edition*

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Jon Swanson, Master Sergeant USMC
United States Marine Corps
jonathan.swanson@usmc.mil
swansonjc@gmail.com