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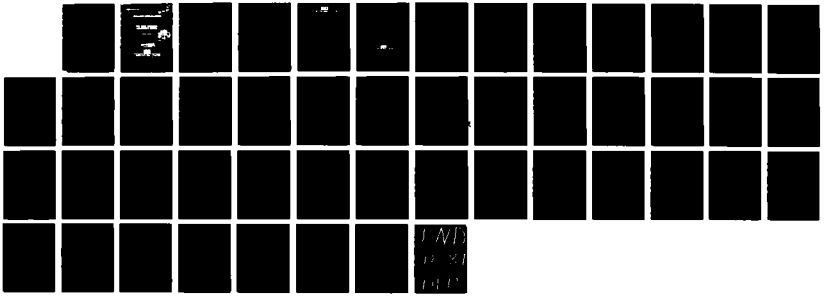

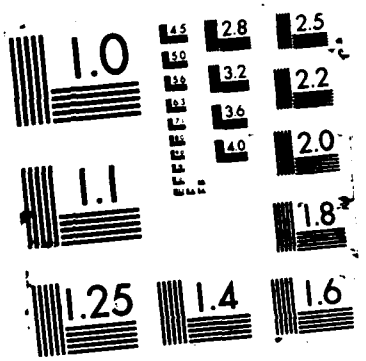
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RESEARCH MEMORANDUM

THE JOINT SPECIALIST COMMUNITY MODEL

Donald J. Cymrot

A Division of CNA Hudson Institute

CENTER FOR NAVAL ANALYSES

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This research memorandum describes the Joint Specialist Community Model designed to provide Navy policymakers and planners with information for managing joint billets and the joint specialist community in ranks 0-4 through 0-6. The model uses variables such as the average billet length and promotion rates to determine both the size of the joint specialist community and the number of 0-6s able to meet the joint service requirement for promotion to ranks 0-7 and above (i.e., flag). The model has been installed on a Lotus 1-2-3 spreadsheet to facilitiate its use in studying policy options. (keywords)

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1. Enclosure (1) is forwarded as a matter of possible interest.

2. This Research Memorandum explains the Joint Specialist Community Model and a Lotus 1-2-3 spreadsheet that contains the logic of the model. This model is designed to help policymakers and planners manage the newly instituted joint specialist community under the provisions of the Department of Defense Reorganization Act of 1986. This effort is part of ongoing CNA support for OPNAV.

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THE JOINT SPECIALIST COMMUNITY MODEL

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ABSTRACT

This research memorandum describes the Joint Specialist Community Model designed to provide Navy policymakers and planners with information for managing joint billets and the joint specialist community in ranks O-4 through O-6. The model uses variables such as the average billet length and promotion rates to determine both the size of the joint specialist community and the number of O-6s able to meet the joint service requirement for promotion to ranks O-7 and above (i.e., flag). The model has been installed on a Lotus 1-2-3 spreadsheet to facilitate its use in studying policy options.

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INTRODUCTION

The Goldwater-Nichols Department of Defense Reorganization Act of 1986 defines a new officer specialty –the joint specialist– and imposes detailed requirements concerning the education, assignment length, and promotion of these specialists. In addition, provisions of the Act place restrictions on the use of joint billets. Because these provisions have important implications for the entire officer corps, CNA developed a Joint Specialist Community Model to provide Navy policymakers and planners with information for managing joint billets and the joint specialist community in ranks O-4 through O-6. This research memorandum briefly discusses the provisions of the Act that affect the joint specialist community and describes the Joint Specialist Community Model that may be used to analyze the implications of the law on the size and makeup of the community. This memorandum also documents a Lotus 1-2-3 spreadsheet that has been designed to capture the logic of the model.

RELEVANT PROVISIONS OF THE DOD REORGANIZATION ACT

The DOD Reorganization Act defines a joint specialist as an officer who has attended a joint professional military education school such as the Armed Forces Staff College or the National Defense University followed by service in a joint-duty assignment. The law defines a joint-duty assignment as involving "matters relating to the integrated employment of land, sea and air forces." An officer may be nominated as a joint specialist once he has attended a joint school and is in his first joint-duty assignment, but he is not designated as a joint specialist until he is actually in his second joint assignment. The law does not require that all nominees fill the second billet and actually become a specialist, but it does require that all specialists who graduate from a joint school have joint-duty assignments in their next tour. Furthermore, at least 50 percent of the graduates of joint schools, whether or not they are joint specialists, must have follow-up joint-duty assignments.

The major role of the joint specialists (not nominees) is to fill certain "critical" joint billets. The law requires a minimum of 1,000 "critical" bil-

lets throughout all of the armed services; the Navy's share is estimated at 266. Most, if not all, of these critical billets are expected to be for O-5s and O-6s.

A further provision requires that 50 percent of all joint billets be filled by joint specialists or joint specialist nominees. In the discussion below this provision is called the fill-rate requirement. This requirement is significant because it may generate a need for joint specialists that goes beyond that generated by the requirements for the critical billets. Increasing the number of joint billets, while holding the number of critical billets constant, can increase the requirement for joint specialists or nominees. The Navy initially estimated the total number of joint billets at about 1,200, which implies a minimum requirement of 600 specialists or nominees filling joint billets at any point in time. Consideration is also being given to a plan that would increase this number of billets by another 400, thereby increasing the requirement for joint specialists by another 200.

The law also requires that the average tour length in these joint billets be 3.5 years. In calculating the average, certain "critical combat specialists" may be excluded.[1] Critical combat specialists are only required to serve a minimum of two years. The existence of critical combat specialists reduces the "actual" average tour length below 3.5 years. The DOD is responsible for defining a critical combat specialist, and so the extent to which the actual average tour length falls below the 3.5 level partially depends on how narrowly or broadly the critical combat specialist is defined.[2] The broader the definition, the lower the actual average tour length.

The law also covers promotion. The promotion rate for joint specialists must be greater than or equal to the rate for officers with OPNAV experience, and the promotion rate for officers serving in joint billets must be

[1]The critical combat specialist should not be confused with a critical billet. A critical billet must be filled by a joint specialist, but not necessarily by a critical combat specialist.

[2]Another factor that affects the actual average is premature attrition from joint billets due to resignation, retirement, or some other cause.

greater than or equal to the overall Navy average. In addition, all officers promoted to flag rank must serve in at least one joint billet prior to promotion. Although it is possible to waive this last requirement, the number of waivers is expected to be small. This joint-duty requirement for promotion to flag imposes a burden on planners to ensure that all O-6s with a reasonable chance of getting promoted to flag are given at least one joint-duty assignment.

THE JOINT SPECIALIST COMMUNITY MODEL

The Joint Specialist Community Model is a steady-state model that devises a plan to fill the "critical" joint billets and meet the fill-rate requirement under the provisions of the DOD Reorganization Act. This model is not a programming model; it does not identify some optimal combination of inputs to achieve an idealized outcome. Rather, it is an easily manipulated tool that calculates two crucial outputs –the size of the joint specialist community and the number of officers with joint experience in the zone for promotion to flag (O-7). The size of these outputs depends upon the values of several policy-related inputs such as promotion rates. Through successive runs, policymakers may become aware of certain tradeoffs in managing both officers in the joint community and the joint billets. For example, the model shows that if the promotion rates for joint specialists are increased, the number of officers that need joint education is decreased. The model is based on a scenario of the career paths of officers who serve in joint billets.[1] As a result of running the model, it may become apparent that some combinations of policies produce results that are either undesirable or infeasible.

Figure 1 illustrates the scenario underlying the model. The purpose of the scenario is to indicate the various paths that officers may follow through the joint arena. The boxes on the left side of the page are the critical billets, and the ones on the right side are the non-critical joint billets, the schooling billets, and the (non-joint) Major Command billets. The figure shows two boxes for joint schooling programs. The program for junior officers (O-4s) is at the Armed Forces Staff College (AFSC), and the program for senior officers (O-5s and O-6s) is at the National Defense University (NDU). The arrows between the boxes show the possible paths through the system. The five arrows starting at the bottom of the page show the entry points into the joint arena. The two going into the schooling boxes show the paths followed by joint specialists, and the other three, going directly into the billet boxes, are the paths of the non-specialists. The arrows at the top

[1]The scenario that this model is based on was developed by Lieutenant Commander Brooks Boatwright, OP-130E40A. Changes in the original scenario were made with the guidance of Captain Harold W. Gehman, OP-130E.

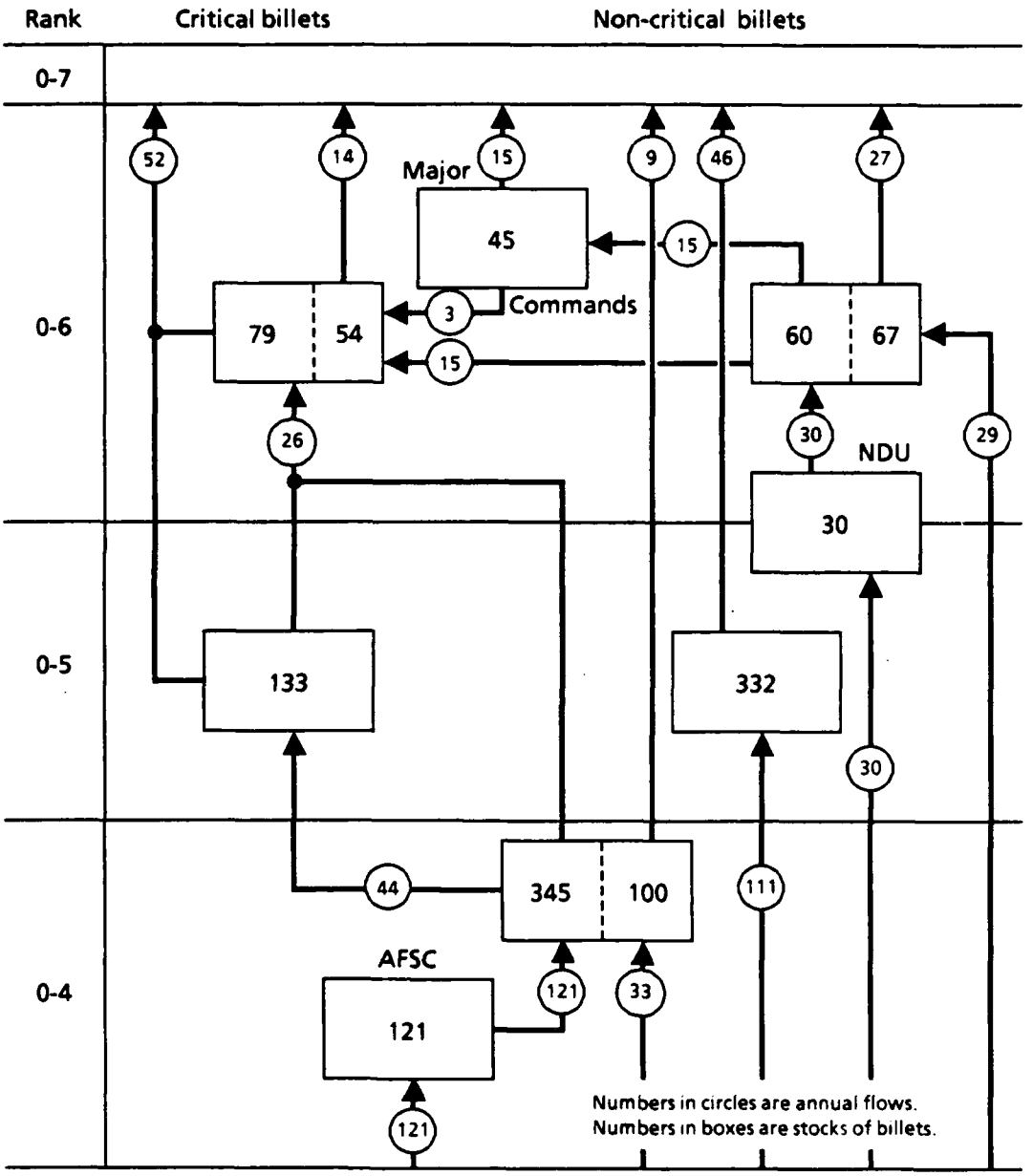

FIG. 1: SCHEMATIC OF THE JOINT SPECIALIST COMMUNITY MODEL

show the flow of personnel with joint experience as they enter the selection zone for promotion to flag (O-7). The numbers on the figure represent the base case described below. The ones in the circles along the arrows are the annual flows of officers into the billet boxes, and the numbers in the boxes are the stock of officers in the billets at a point in time. The dashed lines through some of the boxes indicate that a specific number of billets in that category are devoted to a particular purpose. For example, 345 of the O-4 billets are for joint specialist nominees who recently graduated from the AFSC, and the remaining 100 billets are for non-specialists.

The model produces a plan that has the number of officers in each entry point in the system, the total number of officers of joint specialists and nominees at a point in time, and the number of officers with joint experience entering the selection zone for flag. The calculations are made sequentially. First the model produces a plan to provide the minimum number of specialists required to fill the critical billets. It then checks whether this number is sufficient to meet the fill-rate requirement. If the fill rate is below 50 percent, more joint specialist nominees are added until the rate meets the requirement.

Filling the critical billets requires officers who have had both a joint education and a previous joint-duty assignment. There are two basic paths into the critical billets. Officers may be promoted from the junior ranks (i.e., grown), or they may be lateral entrants into the community at a senior rank. Specialists are grown in the sense that they get their joint education and initial joint-duty experience at a relatively low rank (i.e., O-4), and serve in critical billets after maturing into higher ranks (i.e., O-5 and O-6). The lateral entrants get their first joint-duty assignment as O-6s after attending the senior joint education program at NDU. Among the lateral entrants there are two variations on the path to critical billets. In the first, the officer goes directly from a non-critical billet into a critical billet. In the second, the officer serves in a Major Command between his two joint assignments.

There are some important differences in the way the model handles lateral entrants and grown specialists. The number of lateral entrants is a policy variable in the model. Policymakers can change the number of lateral entrants by either changing the number of graduates from the NDU or the percent of those graduates going into Major Commands.[1] The number of grown specialists is an output of the model. Specialists are grown to fill critical billets not filled by lateral entrants. This number is affected by a wide range of policy variables. A decrease in the number of lateral entrants causes the number of grown specialists to increase, but changes in requirements for grown specialists have no effect on the number of lateral entrants. In addition, O-5 critical billets can only be filled by grown specialists, but O-6 critical billets can be filled by either grown specialists or lateral entrants.

In the model, the requirements to fill the critical billets at the O-5 and O-6 levels are viewed as separate constraints. In most cases only one of the constraints is binding at one time. The size of the joint specialist community depends on whichever constraint is binding. In both cases the requirements are satisfied in terms of an annual flow of specialists, but because O-5 critical billets can only be filled by grown specialists and O-6 criticals can be filled by either type, there are also differences in the ways that the model handles these two constraints.

Requirements under the O-5 constraint are determined as follows. The annual requirement for specialists is the total number of critical billets divided by the average billet length. If there are 120 critical billets at the O-5 level, and the actual average billet length is 3 years, the annual requirement is 40 specialists. The number of students entering the joint education programs annually, which is the input of new junior specialists, must exceed the annual requirement for specialists because of lack of availability, failure to promote, and attrition. For each group of officers that enters the joint specialist arena, only a fraction are expected to ever serve in a critical billet.

[1]There are several other policy variables that have relatively minor effects on the number of lateral entrants including the promotion rate from Major Commands to flag and the availability rate (see below).

Some are expected to leave the Navy. Others never get promoted to O-5 or O-6 and so are not eligible to serve in these billets. Still others may remain in the Navy and be otherwise eligible, but are unavailable because they are more useful in other assignments. The availability rate, promotion rates, and annual attrition rates are all applied to the annual specialists requirement to determine the annual input requirement into the joint education program.

The availability rate is the fraction of qualified personnel actually available to fill critical billets. The availability rate is an indicator of how closely the joint specialist community is managed. As the rate approaches 1, it implies that the careers of joint specialist nominees are carefully managed, and that a relatively high priority has been set to ensure that nearly all promoted nominees do fill critical billets. Conversely, a decrease in the availability rate implies looser management and a lower priority on giving nominees that opportunity to fill critical billets. The availability rate is divided into the number of billets filled to determine the number of joint specialists needed per year. In the example above, 40 O-5s are needed per year. Assuming that the availability rate is 0.67, only two-thirds of the joint specialists are expected to actually serve in critical billets. In this example, there must be 60 (40/0.67) O-5-joint specialists per year.

The number 60 must be further inflated to take into account other losses. If the promotion rate to O-5 is 0.75, there must be 80 (60/0.75) O-4s in the selection zone per year with joint education and experience. Finally, the 80 is divided by the annual attrition rates back to year-of-service (YOS) 9 to account for attrition of joint education graduates.

The major difference between the number of specialists generated from the O-5 and O-6 critical billets is that some of the O-6 billets are filled by lateral entrants. The annual supply of lateral entrants into critical billets is determined by policymakers. There are five policy variables that determine the number of billets filled by lateral entrants. Direct entrants into critical billets equal the number of NDU graduates per year times 1 minus the percent of NDU graduates going to Major Commands. If there are 30

NDU graduates and one-third go to Major Commands, the number of direct lateral entrants is 20 (30*(1-.33)). The number that follow the indirect route serve in critical billets as relatively senior O-6s. The number of these senior O-6s eligible to serve in critical joint billets is the number of NDU graduates who originally went to Major Command minus those who were promoted to flag, retired, or were picked to serve in a sequential command. The number eligible for critical billets is then multiplied times the availability rate (which is discussed in further detail below) to determine the number of senior O-6 lateral entrants. If ten NDU graduates per year go to Major Command, and of these two are promoted to flag, one is given a sequential Major Command, and two retire, the remaining five are eligible for critical billets. If the availability rate is 0.67, three eventually serve in these billets. As a result of these lateral entrants, the number of specialists that need to be grown for the O-6 billets is decreased by 23 (20 directly from NDU plus 3 after Major Command).

The remaining O-6 critical billets are filled by specialists grown from the junior ranks. The method for calculating the number of specialists required to fill those slots for grown O-6s is essentially the same as that for O-5s. The only difference is that O-6s must go through additional attrition and another round of promotion losses.[1] These losses could account for as much as half of the O-5 specialists.

After the model has derived plans to satisfy each constraint, it must choose one for implementation. In other words, it determines which of the constraints is binding. There is a simple rule. Each plan shows the number of specialists or nominees at each YOS between 9 and 30. The plan that has the greater requirement (remember the number of specialists in each plan is the minimum required to fill the critical billets) at the O-5 rank in YOS 15 is considered the binding constraint. The choice of this particular rank and YOS is not significant; both plans have the same availability, promotion, and attrition rates applied to their requirements so that if one plan has greater requirements at this YOS-rank combination, it also has greater requirements at any other combination.

[1] An officer who does not get promoted to O-6 cannot fill an O-6 critical billet.

Once the binding constraint is identified and the critical-billet requirement is met, the model checks the fill-rate requirement. If the fill rate is below 50 percent, additional officers are added to the AFSC input until the number of nominees is sufficient for the fill-rate requirement.

The non-critical billets in this scenario serve as a residual. Some of the non-critical billets are filled by joint specialist nominees. Graduates of both the AFSC and the NDU serve in non-critical billets prior to becoming specialists. Thus, many of the O-4 and O-6 non-critical billets must be devoted to training specialists. The number of non-critical billets that can be filled by non-specialists is the difference between the total number of non-critical billets and the number of billets needed to train specialists.

The model provides information for managing the officer corps under the requirements of the law. This information includes the following: the number of joint specialists by rank; the number of 0-6s in the selection zone for promotion to flag who have served in a joint billet;[1] the number of billets at each rank filled by joint specialists or nominees; the fraction of joint billets filled by joint specialists (the fill rate); the annual input requirement into the Armed Forces Staff College; and the number of non-specialists at each rank needed to fill the non-critical billets each year. Certain combinations of inputs may produce either undesirable or infeasible outcomes. For example, a combination of inputs that requires 500 O-4 billets when only 450 are available is infeasible because the number of billets is insufficient. Also, a combination of inputs that provides only 50 O-6s in the selection zone for flag with joint experience is undesirable because it leaves too little choice in selecting flags. The spreadsheet program used in calculating the model's output cannot distinguish between acceptable and unacceptable outcomes in most cases.[2] Thus, it is the user's responsibility to select input combinations that produce only acceptable outcomes.

[1] Defined as O-6s at YOS 24.

[2] In some cases an asterisk appears when a negative number of billets is needed. Such an outcome actually implies that there is an insufficient number of joint billets given the requirements implied by the inputs.

THE SPREADSHEET

The Joint Specialist Community Model has been installed on a Lotus 1-2-3 spreadsheet. The appendix shows the cell formulae for the spreadsheet. The spreadsheet environment enables the user to examine how changing various policy inputs affects the model's outputs. A table that summarizes these outputs is located in the range A1 through J20 of the spreadsheet; a sample of this table is shown in table 1. Most of the policy inputs of the model are entered in the range A21 through J50, and the remainder of the spreadsheet (A51 through J92, and K1 through AP120) shows the calculations.

Range A1 through D8 sketches the joint specialist community. The O-4 and O-5 numbers are the sum of the number of specialists and nominees in these ranks; the counts include officers currently in joint billets and those who have previously served in joint billets. The count for O-6s is the sum of specialists promoted through the ranks (i.e., grown) and those that entered laterally at the senior level. The lateral entrants include both direct and indirect entrants, but not those who went to Major Commands and never served in a critical billet.

Range A10 through C17 contains the number of billets filled by joint specialists and nominees in a given year. The number at O-5 and O-6 is the number of critical billets at those levels. The number of NDU graduates is twice the annual input into the senior joint school. A two-year joint-duty assignment is assumed to follow graduation from this school.[1] In any year, two graduating classes from NDU are serving in joint-duty assignments. The number at O-4 is the total O-4s[2] required to meet the critical billet

[1] Implicit in this assumption is that lateral entrants are "critical combat specialists," which allows them to serve two-year tours instead of the usual three and a half. If these officers serve longer than two-year average tours, the program must be changed to allocate more non-critical O-6 billets to lateral entrants.

[2] The O-4s and the NDU graduates are joint specialist nominees; the O-5s and O-6s are joint specialists.

Table 1
Spreadsheet Outputs

	A	B	C	D	E	F	G	H	I
1	Number of Specialists					O-6s at YOS 24			
2						with JT Exper			164
3	O-4			741		JSPECS			
4	O-5			512			LATERAL		14
5	O-6			517			GROWN		52
6		Lateral	113			NON-JSPECS			
7		Grow	403				NDU TO MC		15
8	Total			1770			AT O-6		27
9							AT O-5		46
10	BILLETS FILLED BY						AT O-4		9
11	JSPECS AND NOMINEES								
12	O-4		345			NON-JSPEC INPUTS			
13	O-5		133	<< --			O-4	33	
14	O-6		133	>			O-5	111	
15	NDU		60				O-6	29	
16									
17	SUM			671		ANNUAL AFSC INPUTS			121
18	TOTAL BILLETS			1190		O-6 CRIT SHORTAGE			0
19	FILL RATE			.56					
20	EXTRA JSPECS REQ			0		<< --	CONSTRAINT IN EFFECT		

constraint at either the O-5 or O-6 level. An arrow (<< --) in column D indicates whether the O-5 constraint or the O-6 constraint is binding in the current case. The total number of specialists in joint billets (cell C17) is divided by the total number of joint billets (cell C18) to calculate the fraction of joint specialists filling joint billets, which on the table is called the fill rate. The fill rate is shown in cell D19. Cell D20 shows the added number of specialists or nominees needed to raise the fill rate to 0.5. If the number in this cell is greater than zero, that number is added to the AFSC input, and included in the calculation of the size of the joint speciality community and the number of officers with joint experience. However, after the reallocation is made, no adjustment is made in the fill-rate output. The spreadsheet shows that there would have been a violation of the fill-rate requirement without further allocation of non-critical billets to the specialist community.

The range F1 through I10 summarizes the number of O-6s at YOS 24 (the approximate zone for promotion to flag) who have some joint experience. The table is in two parts. The upper part is the number of joint specialists (JSPECS), which includes lateral entrants (LATERAL) and those grown through from lower ranks (GROWN). The lower part shows the number of non-specialists (NON-JSPECS). There are four sources of JSPECS: attendees of NDU who went to Major Commands (MC), and those who had joint experience at ranks O-4, O-5, or O-6.

The range F12 through I15 shows the annual number of non-critical billets by rank that are to be filled by non-specialists. They are calculated by subtracting the number of non-critical billets to be filled by specialist nominees from the total number of non-critical billets at each rank. These numbers serve two functions. With certain combinations of policy inputs, one or more of these numbers become negative. A negative number implies the overall plan is infeasible due to an insufficient number of billets to support the policies implied by the inputs. The simplest way of overcoming the problem is to add the billets until the number is raised to zero. Since the table has average numbers, the negative number must be multiplied times the average billet length to determine the necessary increase in billets. For example, if a given combination of inputs sets the O-4 non-specialist inputs

at -10, and the average billet length is 3 years, the addition of 30 O-4 non-critical billets makes the plan feasible. The other function is to let planners know the annual input requirements to the system.

The final output information on this table is in ANNUAL AFSC INPUTS and the O-6 JSPECS shortage. The AFSC INPUTS contain the number of O-4s needed to enter the system at YOS 9 to produce a sufficient number of specialists to fill the critical billets. The importance of this number is that there may be a limited number of AFSC seats available to the Navy. If this number gets too large, the outcomes shown on the rest of the table are infeasible. The O-6 JSPECS shortage equals zero anytime the O-6 constraint is in effect. If the O-5 constraint is in effect, the number can become greater than zero. A positive number in this cell indicates that the current outcomes are infeasible because both the O-5 and O-6 constraints cannot be filled simultaneously. Filling the O-5 quota leaves a shortage in O-6 specialists, and filling the O-6 quota leaves a shortage in O-5 specialists. In this case new policy inputs are necessary to achieve a feasible solution.

The major policy inputs for the model are shown in the range below the output table. The average billet length is in cell F21.[1] The annual number of NDU graduates is entered in cell F22. Although this cell refers to NDU graduates, it can actually include graduates from any senior level joint professional school. The percent of NDU to Major Commands allocates the NDU graduates between critical billets and non-joint service. The availability rate is in cell F23. As mentioned previously, the availability rate is an indicator of how closely the specialist community is monitored. Cell F24 shows the retention rate adjuster. The actual retention rates are shown in cells AB1 through AL30. The actual retention rates currently in the model are based on actual experience for fiscal year 1985. These

[1]The default in the program is to set the average billet length the same for all billets, both critical and non-critical and all ranks. In rank D51 through F53, the average billet length can be set for the six billet types (i.e., critical-O-6, non-critical-O-6, critical-O-5, etc.). To reset the default after a change has been made, +F21 should be entered into cells D51 through F53.

retention rates are multipled times the adjuster in calculating retention in the model. When the adjuster is set equal to 1, the rates in the model are equal to those in FY85. An increase in the adjuster raises the retention rate, and a decrease lowers them. It is unlikely that retention rates would ever change so much that the adjuster would be set outside the range of 0.9 to 1.1. The adjuster changes all rates proportionally (with a limit for any rate of 1.00); individual rates can be changed by going directly to the AB1 - AL30 range. In cells F27 and F28 are the promotion rates from O-6 to O-7. There are different promotion rates for those in Major Commands and other officers. Promotion rates from O-4 to O-5 and O-5 to O-6 are shown in rows 51 and 52. Different promotion rates can be entered for joint specialists and others serving in joint billets. Although these rates need not be different, the law does require that specialists have the same promotion rate as officers serving in OPNAV, while those serving in joint billets only need to have rates comparable to the all-Navy average. Rows 45 through 47 provide the number of critical billets and non-critical joint billets at each rank. In rows 57 though 59 are average billet lengths also broken down by critical/non-critical and by rank. Currently these billet lengths are set equal to the average billet length shown in cell F22; however, the program has the capability to have different average billet lengths if such an assumption is warranted.

Table 2 shows the values of these inputs used in the example shown in table 1. These values are referred to as the base case in the discussion in the next section.

Table 2
Input Values for
the Base Case

AVERAGE LENGTH OF BILLETS	3	
ANNUAL NDU GRADS	30	
PERCENT NDU TO MJR COMMANDS	.50	
AVAILABILITY RATE	.50	
RETENTION RATE ADJUSTER	1	
O-6 TO O-7 PROMO RATE		
From MJR Commands	.2	
Others	.025	
PROMOTION RATES	JSPECS	OTHERS
O-5 TO O-6	.7	.5
O-4 TO O-5	.8	.7
BILLETS	CRITICAL	JOINT
O-6	133	147
O-5	133	346
O-4	0	445

SENSITIVITY ANALYSIS

Sensitivity analysis is performed on the model to provide policymakers and planners with a better understanding of the forces at work as they plan the Navy's response to the new law. The sensitivity analysis in this section was performed for comparison to the base case described in the previous section. Comparisons are made on four items of output: the total number of joint specialists, the number of O-6s at YOS 24 with joint experience, the AFSC inputs, and the fraction of joint billets filled by specialists.

Table 3 shows that changing the average billet length has a relatively large impact on the size of the joint specialist community. A 3-month decrease in the billet length increases the community size by 10 percent, and increases the O-6 count by about 7 percent. The billet length has little impact on the fill rate, but is inversely related to the AFSC inputs.

The number of NDU graduates (assuming that half go to Major Command regardless of the number) has a varying effect on the overall size of the joint community. Small decreases in the number of seats dec ease the community size, and larger changes increase the community size. The reason for this relationship is that the number of NDU graduates determines whether the O-5 constraint or the O-6 constraint is binding. In the base case, the O-6 constraint is binding, which implies that there is an excess of joint specialists at O-5. At first, when the number of NDU seats increases, the excess supply of O-5s starts to shrink and the community increases. When the number of lateral entrants at O-6 increases sufficiently (at around 35 NDU graduates), the O-5 constraint becomes the binding one. When this occurs, further decreases in lateral entrants must be replaced by increases through promotion. Since more officers are needed to grow each O-6 joint specialist than are needed for lateral entrants, the overall community size starts to increase after this point. The decrease in lateral entrants increases

Table 3
Sensitivity Analysis
Comparisons to the Base Case

Variable	Value	JSPECS	O-6s with JT	Fill Rate	AFSC Input
Base Case		1,770	164	.56	121
AVERAGE BILLET LENGTH (3)					
	2.5	2,244	192	.58	154
	2.75	1,955	176	.57	134
	3.25	1,643	153	.56	112
	3.5	1,534	144	.56	104
NDU GRADS (30)					
	* 0	2,650	175	.68	192
	20	2,125	165	.61	149
	40	1,811	167	.58	121
	60	1,894	174	.61	121
PERCENT NDU TO MC (50)					
	25	1,821	163	.56	121
	75	1,860	166	.58	130
AVAILABILITY RATE (.50)					
	* .25	3,425	207	.85	243
	.75	1,398	155	.47	94
	1	1,386	150	.42	93
RETENTION ADJUSTER (1)					
	.9	2,297	107	.83	295
	1.1	1,995	190	.55	111
PROMOTION RATES					
JSPECS (.8 for O-4-O-5, .7 for O-5-O-6)					
O-4 TO O-5	.7	1,913	159	.61	139
	.9	1,659	167	.53	108
O-5 TO O-6	* .5	2,269	152	.66	163
	.8	1,816	171	.56	121

Base case values shown in parentheses.
* - infeasible

Table 3 (continued)
Sensitivity Analysis
Comparisons to the Base Case

Variable	Value	JSPECS	O-6s with JT	Fill Rate	AFSC Input
Base Case		1,745	260	.54	115
OTHERS (.7 for O-4-O-5, .5 for O-5-O-6)					
O-4 TO O-5	.6	1,770	162	.56	121
	.8	1,770	165	.56	121
O-5 TO O-6	.4	1,770	152	.56	121
	.6	1,770	175	.56	121
TO FLAG (.2 for MC, .025 for Others)					
FROM MC	.1	1,773	164	.56	121
OTHERS	.01	1,773	164	.56	121

Base case values shown in parentheses.
* - infeasible

the O-6 count because each lateral entrant uses two billets at the O-6 level. Without the lateral entrants one of the non-critical billets is available for use by a non-specialist, and the other is available to a specialist grown from the lower ranks. Decreasing the NDU graduates also increases the AFSC input requirements. These examples illustrate why lateral entry is likely to be a necessary component of the Navy's strategy for coping with the law's requirements. If NDU graduates are not used as lateral entrants, the number of O-4 billets is less than the number required to grow a sufficient number of specialists to fill the critical billets. In contrast, changing the percent of NDU graduates going to Major Commands, at least in the range of plus or minus 25 percentage points from the base case, has little impact on any of the variables. Such changes are not sufficiently large to make the O-5 constraint binding and so have little overall effect.

The availability rate is another policy input that has a major impact on the outcome of the model. Decreasing the availability rate to 25 percent is infeasible, given the other values for the inputs, because, once again, there is an insufficient number of non-critical O-4 billets to support the critical billets. Increasing the availability rate decreases the size of the community

and pushes the fill rate below 50 percent. Because of the fall in the fill rate, additional officers are sent to the AFSC, but the overall effect of the higher availability rate is a decline in the annual AFSC Input. A higher availability rate also reduces the number of officers with joint experience at YOS 24. When the availability rate increases, fewer officers become joint specialists and more get joint experience as non-specialists. In terms of survival to YOS 24, this is not an even trade because a higher percent of specialists get promoted (at least in the base case) than non-specialists. If the promotion rates for specialists and non-specialists are made equal, increases in the availability rate cause the number of officers with joint experience to increase.

The retention rates, which, at best, are only partially controlled by policymakers, have the largest impact on the number of O-6s with joint experience. When the retention rates fall to 90 percent of their 1985 levels, there is a sharp drop in the number of O-6s with joint experience. As the retention rates drop, more of the non-critical billets are needed to grow a sufficient number of joint specialists to fill the critical billets. In this case, joint specialists become an increasingly larger proportion of those with joint experience as the non-specialists get squeezed out of the community by the need to fill critical billets. The drop in retention also pushes up the requirements for AFSC seats. A drop in the retention rate among officers with joint experience would clearly be cause for concern, and would likely require some offsetting action on the part of policymakers to ensure that the Navy is able to meet both the requirements of the law and its need for a pool of qualified candidates for promotion to flag.

Three groups of promotion rates are considered in the model. In order of importance these groups are: joint specialists, non-specialists, and promotion to flag. The promotion rates in the joint community are inversely related to the size of the community and directly related to the number of O-6s with joint experience. As the promotion rate increases, fewer O-4s are needed to produce enough O-5s and O-6s to fill critical billets, and so the community shrinks. A smaller joint specialist community means that more non-critical billets are available to be filled by non-specialists, and so

more officers get to have a joint-duty assignment. The promotion rates for non-specialists have no effect on the specialist community, but are directly related to the number of O-6s with joint experience. The promotion rates to flag have almost no effect on any variables because the numbers of promotions to flag are small.

O-6s WITH JOINT EXPERIENCE

A key output of the Joint Specialist Community Model is the number of O-6s at YOS 24 with joint experience. This number is important because joint experience is required for promotion to flag. The sensitivity analysis on this variable showed remarkably little variation. Based on a billet structure of 1,190 joint billets, and the distribution of 133 critical billets each at O-5 and O-6, the number of O-6s with joint experience varies in a narrow range. In nearly all of the feasible cases the number is between 150 and 180. [1]

Policymakers must determine if the current estimates of the O-6s with joint experience provide an acceptable amount of choice in selecting flags. If approximately 165 O-6s are considered inadequate, the Joint Specialist Community Model can be used to explore the effect of policy changes that might be instituted to increase this number.

To illustrate how the model could be used to explore policies to increase the number of O-6s with joint experience, consider three examples: making the billets more senior, selectively reducing the average billet length, and increasing the total number of billets to the Navy's share of all joint billets.

The first example involves shifting some of the O-4 and O-5 billets to the O-6 level. By providing officers with joint experience at the O-6 level rather than earlier, there is less attrition so that a higher proportion of those who have had joint experience are still in the Navy at YOS 24. Table 4 shows the effect of first shifting critical billets from O-5 to O-6, and then shifting some non-critical billets.

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[1] The one exception to this relative stability occurs when there is a sharp decrease in the retention rate. Such a decrease can be at least partially offset by increasing promotion opportunities. If retention does fall significantly, the promotion rate of continuing officers may have to rise just to fill billets.

Table 4
The Effect of Shifting Billets Across Ranks

Number of Billets O-6 Critical	O-6s with Joint Experience From O-5	
133	164	
140	166	
150	165	
160	165	
170	167	
180	170	
190	172	
O-6 Non-Critical	From O-4	From O-5
140	166	166
150	169	168
160	171	170
170	173	172
200	180	177

Shifting critical billets from O-5 to O-6 has little effect on the total with joint experience. Initially, the total with joint experience remains about the same,[1] and then increases by a little more than two for every shift of ten billets. Beyond 190 O-6 billets, it becomes impossible to grow enough O-6s with the allotment of O-4 billets. Given the values for the other inputs, the strategy of shifting critical billets from O-5 to O-6 yields only a small increase in the joint experience total.

The effect of shifting the non-critical billets from O-4 or O-5 to O-6 creates a larger increase in officers with joint experience than the other strategy. Because of attrition and failure to select for higher ranks, an officer at O-4 getting joint experience only has about a 20 percent chance of reaching O-6, and an officer at O-5 only has about a 40 percent chance. The shift of ten billets to O-6 increases the O-6 total by eight (from O-4), and six (from O-5). The average increase is calculated by dividing these

[1]The shift does increase the number of specialists at O-6, but this increase is offset by a decrease in non-specialists.

totals by the average billet length (three years in the base case). For every ten-billet shift from O-4 to O-6, the annual O-6 count increases by about three, and for every ten-billet shift from O-5 to O-6, the annual O-6 count increases by about two.

The second example involves establishing one policy to fill the O-5 non-critical billets with post-command or command-screened officers only and another policy to define these personnel as "critical combat specialists." Critical combat specialists need only serve two-year tours in joint billets. Officers screened for command are considered among the best officers in the Navy. Their promotion chances are higher than the average officer. Table 5 shows the effect of reducing the average billet length and the promotion rate for non-specialists O-5 on the number of O-6s with joint experience.

Table 5
The Effect of Making
O-5s Critical Combat Specialists

Parameter Change	O-6s with Jt Experience
Changes for O-5s	
Avg Blt Length 2 yrs	190
O-5 to O-6 PROMO .7	190
Both Changes for O-5s	223
Changes for O-6s	
Avg Blt Length 2 yrs	174
Changes for both O-5s and O-6s	231

The table also shows decreasing average billet length to two years for O-6s, the combined effect if all non-critical billets at both the O-5 and O-6 level have a two-year average billet length. Changing the O-5 average billet length to two years has a much larger effect on the O-6 total with joint experience because there are about 200 more non-critical billets at O-5 than at O-6, and many of the non-critical billets are already assumed to be filled by NDU graduates, which leaves only about 50 O-6 non-critical billets to be filled. Making the specified changes for O-5s increases the number of

O-6s with joint experience by about one-third. This strategy is the most effective of those considered in this analysis. A particularly useful aspect of this strategy is that it is in complete control of the Navy to implement, and thus does not require an outside agency's approval.

The third example is to increase the number of joint billets to the Navy's share of total joint billets. It has been estimated that this share would increase to 1,661 billets. An increase in the number of joint billets would not necessarily lead to an increase in the the number of critical billets. Suppose that the number of O-6 billets is increased from 280 to 350, the O-5 billets from 465 to 666, and the O-4 billets from 445 to 645.[1] Table 6 shows some examples of the model's output with the larger number of billets (using base-case inputs except as noted). The upper part of the table shows the model output when the promotion rates for specialists are at the base-case level of 0.8 for promotion from O-4 to O-5, and 0.7 for promotion from O-5 to O-6. The bottom part of the table shows the output when promotion rates are set at historical levels of 0.7 for promotion from O-4 to O-5, and 0.5 for promotion from O-5 to O-6.

Table 6
Model Outputs with 1,661 Joint Billets

Variable Value	JSPECS	O-6s with JT	Fill Rate	AFSC Input
		Base Case Promotion Rates		
ABL 3	2,497	227	.40	175
ABL 2.5	3,014	267	.42	210
		Historic Promotion Rates		
ABL 3	2,480	213	.51	186
ABL 2.5	3,263	250	.55	247

[1]This distribution of billets was included at the suggestion of Captain Gehman.

Increasing the number of billets substantially changes all of the outputs. The number of specialists, number of O-6s with joint experience, and the AFSC input all increase by more than one-third, which is roughly proportional to the increase in the number of billets. The fill rate declines as the number of billets increase, and, in fact, at the base-case promotion rate levels, the rate would fall below the legal requirement unless additional officers are sent to joint education with the sole purpose of meeting the fill-rate requirement. Decreasing the promotion rates to historical levels is another way of meeting the fill-rate requirement, but the lower promotion rates require an even larger joint specialists community. Although the larger number of billets does have the "cost of greater officer inputs," it does generate more officers eligible for promotion to flag. It is beyond the scope of this model to determine whether the benefit is greater than the cost. Such decisions are within the realm of policymakers.

CONCLUSION

The Department of Defense Reorganization Act of 1986 is likely to have an important impact on the way in which the Navy manages officers who participate in the joint arena. The Joint Specialist Community Model is designed to help the Navy deal with some issues relating to the careers of O-4s through O-6s that arise from this new law. Based on certain policy inputs, the model constructs a structure for the joint specialist community and provides other information related to the requirements of the law.

This research memorandum reviews the law as it pertains to ranks O-4s to O-6s and describes the Joint Specialist Community Model. This model has been installed on a Lotus 1-2-3 spreadsheet. The spreadsheet program was used to examine the sensitivity of various factors to the model's inputs.

The analysis in this paper suggests that the average billet length, number of NDU graduates, and the availability rate are three factors that significantly affect the size of the joint specialist community. The effects of other factors such as changes in the retention rate or promotion rates are smaller.

Although the Joint Specialist Community Model should provide useful information to policymakers and planners, it does not provide an optimal policy or community size. The model provides information for sound decisionmaking; it does not make decisions.

APPENDIX

CELL FORMULAE FOR THE JOINT SPECIALIST COMMUNITY MODEL SPREADSHEET

APPENDIX

CELL FORMULAE FOR THE JOINT SPECIALIST COMMUNITY MODEL SPREADSHEET

This appendix contains the formulae for the Joint Specialist Community Model spreadsheet. The cell address is shown at the beginning of each line. The address is usually followed by information describing the cell shown on the spreadsheet. The term in parentheses () gives the number of decimal places, and the term in brackets [] gives the cell width. The last part of each line shows the contents of the cell. In some cases the numbers are directly entered into the cell, and in other cases there are formulae. When a formula appears, it usually makes reference to other cell addresses. When this occurs, the contents of the cell in the address are used in calculating the value of the formula.

```
A1: [W9] 'NUMBER OF JSPECS
B1: [W7] ' JSPECS
C1: [W5] '
D1: [W5] '
E1: ^I
F1: [W7] 'O-6s AT YOS 24
J1: [W7] ^I
K1: [W9] 'O-6
Z1: ' NON-SPECIALISTS
AM1: [W5] 'RETEN
AN1: [W6] 'TION
AO1: [W6] 'RATES
E2: ^I
F2: [W7] '   WITH JT EXPER
I2: (F0) [W9] @SUM(I4..I10)
J2: [W7] ^I
K2: [W9] 'YOS
L2: [W5] 21
M2: [W5] 22
N2: [W5] 23
O2: [W5] 24
P2: [W5] 25
Q2: [W5] 26
R2: [W5] 27
S2: [W5] 28
T2: [W5] 29
U2: [W5] 30
Z2: 'FILLED JOINT BILLETS
AM2: [W5] 'FOR JOINT SPECIALISTS
A3: [W9] 'O-4
D3: (F0) [W5] @IF(F39>L39,L122,L27)
E3: ^I
F3: [W7] 'JSPECS
G3: [W5] '
J3: [W7] ^I
K3: [W9] 'RET RATE
L3: [W5] @IF(AJ5*$F$28>1,1,AJ5*$F$28)
M3: [W5] @IF(AK5*$F$28>1,1,AK5*$F$28)
N3: [W5] @IF(AL5*$F$28>1,1,AL5*$F$28)
O3: [W5] @IF(AM5*$F$28>1,1,AM5*$F$28)
P3: [W5] @IF(AN5*$F$28>1,1,AN5*$F$28)
Q3: [W5] @IF(AO5*$F$28>1,1,AO5*$F$28)
R3: [W5] @IF(AP5*$F$28>1,1,AP5*$F$28)
S3: [W5] @IF(AQ5*$F$28>1,1,AQ5*$F$28)
T3: [W5] @IF(AR5*$F$28>1,1,AR5*$F$28)
U3: [W5] @IF(AS5*$F$28>1,1,AS5*$F$28)
```

```
AN3: [W6] 'O6
A4: [W9] 'O-5
D4: (F0) [W5] @IF(F39>L39,L115,$L$20)
E4: ^I
G4: [W5] 'LATERAL
I4: (F0) [W9] @IF(O7<0,0,O7)
J4: [W7] ^I
P4: [W5] 'NDU GRADS
X4: [W15] 'O-6
AI4: [W9] 'LOS
AJ4: [W5] 21
AK4: [W5] 22
AL4: [W6] 23
AM4: [W5] 24
AN4: [W6] 25
AO4: [W6] 26
AP4: [W5] 27
AQ4: [W5] 28
AR4: [W5] 29
AS4: [W5] 30
A5: [W9] 'O-6
D5: (F0) [W5] +C7+C6
E5: ^I
G5: [W5] 'GROWN
I5: (F0) [W9] @IF(F39>L39,O81,O31)
J5: [W7] ^I
K5: [W9] 'DIRECT
L5: (F0) [W5] +E66
M5: (F0) [W5] +L3*L5
N5: (F0) [W5] +M3*M5
O5: (F0) [W5] +N3*N5
P5: (F0) [W5] +O3*O5
Q5: (F0) [W5] +P3*P5
R5: (F0) [W5] +Q3*Q5
S5: (F0) [W5] +R3*R5
T5: (F0) [W5] +S3*S5
U5: (F0) [W5] +T3*T5
V5: (F0) [W5] +U3*U5
W5: (F0) [W5] '
X5: [W15] 'YOS
Y5: [W5] 21
Z5: 22
AA5: [W5] 23
AB5: [W5] 24
AC5: [W5] 25
AD5: [W5] 26
```

```
AI5: [W9] 'RR
AJ5: [W5] 0.99
AK5: [W5] 1
AL5: [W6] 0.94
AM5: [W5] 0.94
AN5: [W6] 0.88
AO5: [W6] 0.85
AP5: [W5] 0.84
AQ5: [W5] 0.77
AR5: [W5] 0.25
AS5: [W5] 0.15
B6: [W7] 'Lateral
C6: (F0) [W5] +L8
E6: ^I
F6: [W7] 'NON-JSPECS
J6: [W7] ^I
K6: [W9] 'AFTER MC
Q6: (F0) [W5] @IF(E72<0,0,E72*F27)
R6: (F0) [W5] +Q6*Q3
S6: (F0) [W5] +R6*R3
T6: (F0) [W5] +S6*S3
U6: (F0) [W5] +T6*T3
V6: (F0) [W5] +U6*U3
X6: [W15] 'RET RATE
Y6: (F2) [W5] @IF(AJ23*$F$28>1,1,AJ23*$F$28)
Z6: (F2) @IF(AK23*$F$28>1,1,AK23*$F$28)
AA6: (F2) [W5] @IF(AL23*$F$28>1,1,AL23*$F$28)
AB6: (F2) [W5] @IF(AM23*$F$28>1,1,AM23*$F$28)
AC6: (F2) [W5] @IF(AN23*$F$28>1,1,AN23*$F$28)
AD6: (F2) [W5] @IF(AO23*$F$28>1,1,AO23*$F$28)
B7: [W7] 'Grow
C7: (F0) [W5] @IF(F39>L39,L108,L13)
E7: ^I
G7: [W5] 'NDU IN MC
I7: (F0) [W9] @IF(D68<0,0,D68)
J7: [W7] ^I
K7: [W9] 'TOT PER YR
L7: (F0) [W5] @SUM(L5..L6)
M7: (F0) [W5] @SUM(M5..M6)
N7: (F0) [W5] @SUM(N5..N6)
O7: (F0) [W5] @SUM(O5..O6)
P7: (F0) [W5] @SUM(P5..P6)
Q7: (F0) [W5] @SUM(Q5..Q6)
R7: (F0) [W5] @SUM(R5..R6)
S7: (F0) [W5] @SUM(S5..S6)
T7: (F0) [W5] @SUM(T5..T6)
```

```
U7: (F0) [W5] @SUM(U5..U6)
V7: (F0) [W5] 0
X7: [W15] 'TOTAL NOT JSPEC
Y7: (F0) [W5] @SUM(Y8..Y10)
Z7: (F0) +Y6*Y7
AA7: (F0) [W5] +Z6*Z7
AB7: (F0) [W5] +AA6*AA7
AC7: (F0) [W5] +AB6*AB7
AD7: (F0) [W5] +AC6*AC7
AN7: [W6] 'O5
A8: [W9] 'TOT
D8: (F0) [W5] @SUM(D3..D5)
E8: ^I
G8: [W5] 'AT O-6
I8: (F0) [W9] @IF(AB8<0,0,AB8)
J8: [W7] ^I
K8: [W9] 'SUM
L8: (F0) [W5] @IF(F25=0,0,@SUM(L7..U7))
X8: [W15] 'O-6 NOT JSPEC
Y8: (F0) [W5] (F45-F25*2)/F55
Z8: (F0) +Y8*$Y$6
AA8: (F0) [W5] +Z8*$Z$6
AB8: (F0) [W5] +AA8*$AA$6
AI8: [W9] 'LOS
AJ8: [W5] 15
AK8: [W5] 16
AL8: [W6] 17
AM8: [W5] 18
AN8: [W6] 19
AO8: [W6] 20
AP8: [W5] 21
AQ8: [W5] 22
AR8: [W5] 23
AS8: [W5] 24
AT8: [W5] 25
A9: [W9] '=====================================
E9: '====I
G9: [W5] 'AT O-5
I9: (F0) [W9] @IF(AB9<0,0,AB9)
J9: [W7] ^I
L9: [W5] 'Calculate the number of JSPECS
X9: [W15] 'GROWN FROM O-5
Y9: (F0) [W5] +AE16
Z9: (F0) +Y9*$Y$6
AA9: (F0) [W5] +Z9*$Z$6
AB9: (F0) [W5] +AA9*$AA$6
```

```
AI9: [W9] 'RR
AJ9: (F2) [W5] 1
AK9: (F2) [W5] 0.98
AL9: (F2) [W6] 0.98
AM9: (F2) [W5] 0.94
AN9: (F2) [W6] 0.88
AO9: (F2) [W6] 0.85
AP9: (F2) [W5] 0.8
AQ9: (F2) [W5] 0.79
AR9: (F2) [W5] 0.68
AS9: (F2) [W5] 0.77
AT9: (F2) [W5] 0.1
A10: [W9] 'BILLETS FILLED BY JSPECS
E10: ^I
G10: [W5] 'AT O-4
I10: (F0) [W9] @IF(AB10<0,0,AB10)
J10: [W7] ^I
P10: [W5] 'OTHER CAPTS
X10: [W15] 'GROWN FROM O-4
Y10: (F0) [W5] +AE18
Z10: (F0) +Y10*$Y$6
AA10: (F0) [W5] +Z10*$Z$6
AB10: (F0) [W5] +AA10*$AA$6
A11: [W9] '  AND JSPEC NOMINEES
E11: '     I====
F11: [W7] '============================
J11: [W7] '===I
K11: [W9] 'PER YOS
L11: (F0) [W5] +R19
M11: (F0) [W5] +L3*L11
N11: (F0) [W5] +M3*M11
O11: (F0) [W5] +N3*N11
P11: (F0) [W5] +O3*O11-P12
Q11: (F0) [W5] +P3*P11
R11: (F0) [W5] +Q3*Q11
S11: (F0) [W5] +R3*R11
T11: (F0) [W5] +S3*S11
U11: (F0) [W5] +T3*T11
V11: (F0) [W5] +U3*U11
AN11: [W6] 'O4
A12: [W9] 'O-4
C12: (F0) [W5] @IF(F39>L39,L99,L50)
E12: ^I
F12: [W7] 'NON-JSPEC INPUTS
J12: [W7] ^I
K12: [W9] 'PROMO LOSS
```

```
P12: (F0) [W5] +F33*O11
X12: [W15] 'O-5
AI12: [W9] 'LOS
AJ12: [W5] 9
AK12: [W5] 10
AL12: [W6] 11
AM12: [W5] 12
AN12: [W6] 13
AO12: [W6] 14
AP12: [W5] 15
AQ12: [W5] 16
AR12: [W5] 17
A13: [W9] 'O-5
C13: (F0) [W5] +D46
D13: [W5] @IF(F39>L39,F20,A96)
E13: ^I
G13: [W5] 'O-4
I13: (F0) [W9] +Y24
J13: [W7] ^I
K13: [W9] 'SUM
L13: (F0) [W5] @SUM(L11..V11)
X13: [W15] 'YOS
Y13: [W5] 15
Z13: 16
AA13: [W5] 17
AB13: [W5] 18
AC13: [W5] 19
AD13: [W5] 20
AE13: [W5] 21
AI13: [W9] 'RR
AJ13: (F2) [W5] 0.98
AK13: (F2) [W5] 0.98
AL13: (F2) [W6] 0.97
AM13: (F2) [W5] 0.98
AN13: (F2) [W6] 0.98
AO13: (F2) [W6] 0.98
AP13: (F2) [W5] 0.97
AQ13: (F2) [W5] 0.98
AR13: (F2) [W5] 0.98
A14: [W9] 'O-6
C14: (F0) [W5] +D45
D14: [W5] @IF(F39<L39,F20,A96)
E14: ^I
G14: [W5] 'O-5
I14: (F0) [W9] +Y15
J14: [W7] ^I
```

```
X14: [W15] 'RET RATE
Y14: (F2) [W5] @IF(AJ27*$F$28>1,1,AJ27*$F$28)
Z14: (F2) @IF(AK27*$F$28>1,1,AK27*$F$28)
AA14: (F2) [W5] @IF(AL27*$F$28>1,1,AL27*$F$28)
AB14: (F2) [W5] @IF(AM27*$F$28>1,1,AM27*$F$28)
AC14: (F2) [W5] @IF(AN27*$F$28>1,1,AN27*$F$28)
AD14: (F2) [W5] @IF(AO27*$F$28>1,1,AO27*$F$28)
AE14: (F2) [W5] @IF(AP27*$F$28>1,1,AP27*$F$28)
A15: [W9] 'NDU
C15: (F0) [W5] +F25*2
E15: ^I
G15: [W5] 'O-6
I15: (F0) [W9] +Y8
J15: [W7] ^I
K15: [W9] 'O-5
X15: [W15] 'PER YOS
Y15: (F0) [W5] (D46+F46-(C13+E91))/F56
Z15: (F0) +Y15*Y14
AA15: (F0) [W5] +Z15*Z14
AB15: (F0) [W5] +AA15*AA14
AC15: (F0) [W5] +AB15*AB14
AD15: (F0) [W5] +AC15*AC14
AE15: (F0) [W5] +AD15*AD14
E16: '     I====
F16: [W7] '============================
J16: [W7] '===I
K16: [W9] 'YOS
L16: [W5] 15
M16: [W5] 16
N16: [W5] 17
O16: [W5] 18
P16: [W5] 19
Q16: [W5] 20
R16: [W5] 21
S16: [W5] 22
T16: [W5] 23
U16: [W5] 24
V16: [W5] 25
X16: [W15] 'PROMO TO O-6 WITH JT EXPERIENCE AT O-5
AE16: (F0) [W5] +AC15*F52
A17: [W9] 'SUM
C17: (F0) [W5] @SUM(C12..C15)
E17: ^I
F17: [W7] 'ANNUAL AFSC INPUTS
I17: (F0) [W9] @IF(F39>L39,L95+E84,L46+E84)
J17: [W7] ^I
```

```
K17: [W9] 'RET RATE
L17: (F2) [W5] @IF(AJ9*$F$28>1,1,AJ9*$F$28)
M17: (F2) [W5] @IF(AK9*$F$28>1,1,AK9*$F$28)
N17: (F2) [W5] @IF(AL9*$F$28>1,1,AL9*$F$28)
O17: (F2) [W5] @IF(AM9*$F$28>1,1,AM9*$F$28)
P17: (F2) [W5] @IF(AN9*$F$28>1,1,AN9*$F$28)
Q17: (F2) [W5] @IF(AO9*$F$28>1,1,AO9*$F$28)
R17: (F2) [W5] @IF(AP9*$F$28>1,1,AP9*$F$28)
S17: (F2) [W5] @IF(AQ9*$F$28>1,1,AQ9*$F$28)
T17: (F2) [W5] @IF(AR9*$F$28>1,1,AR9*$F$28)
U17: (F2) [W5] @IF(AS9*$F$28>1,1,AS9*$F$28)
V17: (F2) [W5] @IF(AT9*$F$28>1,1,AT9*$F$28)
Y17: (F0) [W5] +AE25
Z17: (F0) +Y17*Y14
AA17: (F0) [W5] +Z17*Z14
AB17: (F0) [W5] +AA17*AA14
AC17: (F0) [W5] +AB17*AB14
AD17: (F0) [W5] +AC17*AC14
AE17: (F0) [W5] +AD17*AD14
A18: [W9] 'TOT JT BILLETS
C18: [W5] +H48
E18: ^I
F18: [W7] 'O-6 JSPEC SHORTAGE
I18: (F0) [W9] @IF(F39>L39,V83,0)
J18: [W7] ^I
K18: [W9] 'PER YOS
L18: (F0) [W5] +R26+E91
M18: (F0) [W5] +L17*L18
N18: (F0) [W5] +M17*M18
O18: (F0) [W5] +N17*N18
P18: (F0) [W5] +O17*O18
Q18: (F0) [W5] +P17*P18
R18: (F0) [W5] +Q17*Q18-R19
S18: (F0) [W5] +R17*R18
T18: (F0) [W5] +S17*S18
U18: (F0) [W5] +T17*T18
V18: (F0) [W5] +U17*U18
W18: (F0) [W5] +V17*V18
X18: [W15] 'PROMO TO O-6 WITH JT EXPERIENCE AT O-4
AE18: (F0) [W5] +AC17*F52
A19: [W9] 'FILL RATE
D19: (F2) [W5] +C17/@SUM(D45..F47)
E19: '     I====
F19: [W7] '============================
J19: [W7] '===I
K19: [W9] 'PROM LOSS
```

```
     R19: (F0) [W5] +P18*D52
     AM19: [W5] 'RETENTION RATES
     A20: [W9] 'FILL RATE SHORTAGE
     D20: (F0) [W5] @IF(0.5*C18-C17>0,0.5*C18-C17,0)
     E20: ^I
     F20: [W7] ' <<--
     G20: [W5] 'CONSTRAINT IN EFFECT
     K20: [W9] 'SUM
     L20: (F0) [W5] @SUM(L18..W18)
     R20: [W5] '
     AM20: [W5] 'FOR NON-JOINT SPECIALISTS
     X21: [W15] 'O-4
     AN21: [W6] 'O6
     A22: [W9] 'MODEL INPUTS  **********************
******
     K22: [W9] 'O-4
     X22: [W15] 'YOS
     Y22: [W5] 9
     Z22: 10
     AA22: [W5] 11
     AB22: [W5] 12
     AC22: [W5] 13
     AD22: [W5] 14
     AE22: [W5] 15
     AI22: [W9] 'LOS
     AJ22: [W5] 21
     AK22: [W5] 22
     AL22: [W6] 23
     AM22: [W5] 24
     AN22: [W6] 25
     AO22: [W6] 26
     AP22: [W5] 27
     AQ22: [W5] 28
     AR22: [W5] 29
     AS22: [W5] 30
     K23: [W9] 'YOS
     L23: [W5] 9
     M23: [W5] 10
     N23: [W5] 11
     O23: [W5] 12
     P23: [W5] 13
     Q23: [W5] 14
     R23: [W5] 15
     S23: [W5] 16
     T23: [W5] 17
     U23: [W5] '
     X23: [W15] 'RET RATE
```

```
Y23: (F2) [W5] @IF(AJ31*$F$28>1,1,AJ31*$F$28)
Z23: (F2) @IF(AK31*$F$28>1,1,AK31*$F$28)
AA23: (F2) [W5] @IF(AL31*$F$28>1,1,AL31*$F$28)
AB23: (F2) [W5] @IF(AM31*$F$28>1,1,AM31*$F$28)
AC23: (F2) [W5] @IF(AN31*$F$28>1,1,AN31*$F$28)
AD23: (F2) [W5] @IF(AO31*$F$28>1,1,AO31*$F$28)
AE23: (F2) [W5] @IF(AP31*$F$28>1,1,AP31*$F$28)
AI23: [W9] 'RR
AJ23: [W5] 0.99
AK23: [W5] 1
AL23: [W6] 0.94
AM23: [W5] 0.94
AN23: [W6] 0.88
AO23: [W6] 0.85
AP23: [W5] 0.84
AQ23: [W5] 0.77
AR23: [W5] 0.25
AS23: [W5] 0.15
A24: [W9] 'AVG LENGTH OF BILLET
F24: [W7] 3
K24: [W9] 'RET RATE
L24: (F2) [W5] @IF(AJ13*$F$28>1,1,AJ13*$F$28)
M24: (F2) [W5] @IF(AK13*$F$28>1,1,AK13*$F$28)
N24: (F2) [W5] @IF(AL13*$F$28>1,1,AL13*$F$28)
O24: (F2) [W5] @IF(AM13*$F$28>1,1,AM13*$F$28)
P24: (F2) [W5] @IF(AN13*$F$28>1,1,AN13*$F$28)
Q24: (F2) [W5] @IF(AO13*$F$28>1,1,AO13*$F$28)
R24: (F2) [W5] @IF(AP13*$F$28>1,1,AP13*$F$28)
S24: (F2) [W5] @IF(AQ13*$F$28>1,1,AQ13*$F$28)
T24: (F2) [W5] @IF(AR13*$F$28>1,1,AR13*$F$28)
V24: [W5] '
X24: [W15] 'PER YOS
Y24: (F0) [W5] (D47+F47-(C12+E90))/F57
Z24: (F0) +Y24*Y23
AA24: (F0) [W5] +Z24*Z23
AB24: (F0) [W5] +AA24*AA23
AC24: (F0) [W5] +AB24*AB23
AD24: (F0) [W5] +AC24*AC23
AE24: (F0) [W5] +AD24*AD23
```

END

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DTIC