

Human Resources and Training Seminar



**Human Resource Planning to
Support Operational Requirements or
“Tactical Human Resource Planning”**

Overview

- ③ **Operational Factors**
- ③ **Staffing Methodology**
- ③ **“Working Unit” and “Staffing Factor”**
- ③ **Staffing ATS Facilities**
- ③ **Staffing for Technical Support and other Aeronautical Fields**



**Tactical human resource
planning ensures that an
organization has sufficient
human resources to meet
existing requirements**

Planning Process

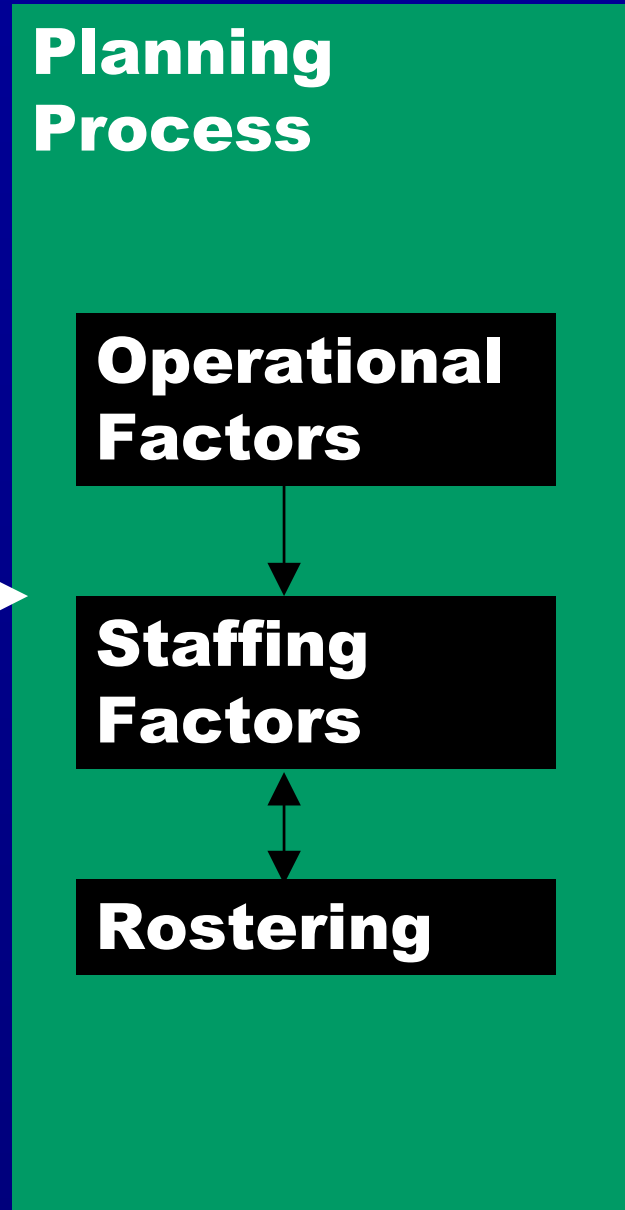
Technology Insertion

Operational Factors

Staffing Factors

Rostering

Human Resource Demand Forecast (3 to 5 years)



Air Traffic Control Operational Factors



Operational Factors

③ **Determine the human resources required to maintain the function of a facility**

③ **Examples:**

- ▶ Hours of operation
- ▶ Number of sectors within an ACC
- ▶ Workload within sectors



Airspace Capacity

Maximum number of aircraft that can be safely accommodated within a sector or aerodrome. Normally expressed as the maximum number of aircraft that can be accepted over a given period of time.



Airspace Capacity Factors Include:

- ③ Traffic type, mix and level
- ③ Complexity of the control area
- ③ Types of CNS systems in use
- ③ Availability of controller support and alert systems

**The solution to human
resource shortages is
not always adding
additional staff!**

Airspace Factors

- ③ Number of ATS routes served
- ③ Number of intersections
- ③ Number of major terminal areas and number of aerodromes
- ③ Proportion of aircraft in level flight, climb or descent
- ③ Airspeeds and levels of aircraft
- ③ Coordination requirements
- ③ Availability of new technologies



Controller Capacity

Number of aircraft that can be handled by a controller within a certain period of time for a given sector size and complexity, taking into account **observable, non-observable tasks, plus any additional time which provides the controller a safe margin for **recuperation time**.**



Determining Controller Capacity

- ③ Expert opinion
- ③ Fast-time modeling
- ③ Controller capacity also varies among individual controllers

Planning Process

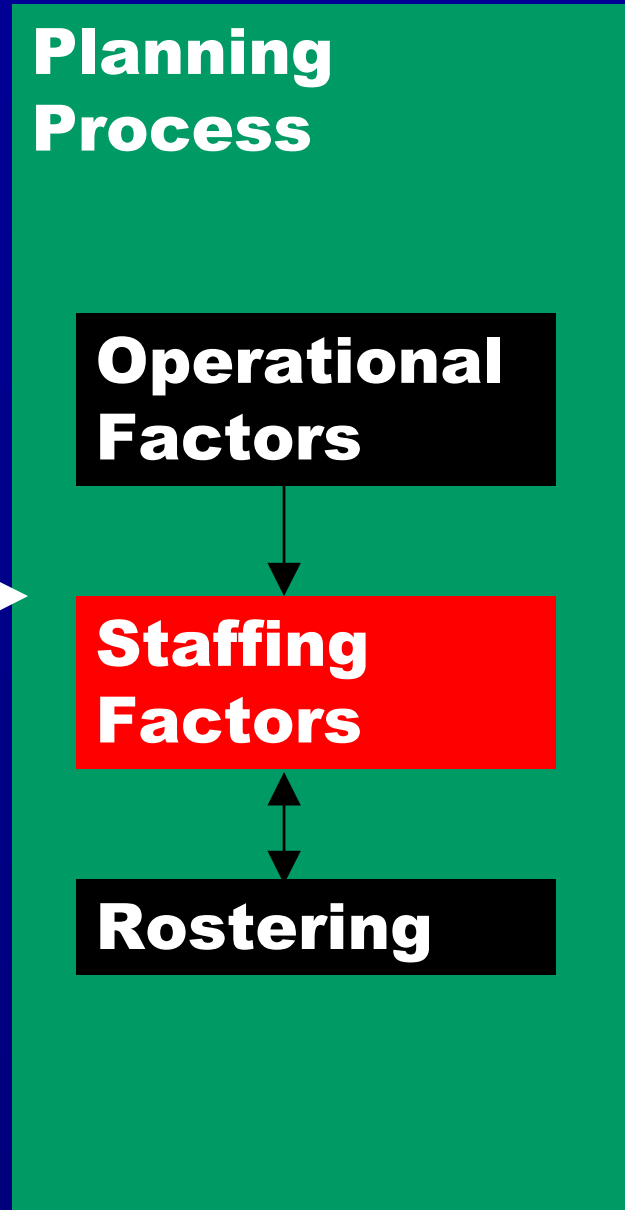
Operational Factors

Technology Insertion

Staffing Factors

Human Resource Demand Forecast (3 to 5 years)

Rostering



Staffing Methodology

Staffing Factors

Working Unit

Staffing Unit

**Adjustment
Factor**

Working Unit

The hours per year a person is available to work. This definition is based upon the effective working hours per day and effective workdays per year.



Operational Staffing Factor

Represents the minimum staff to cover a work function for a specified period of operation. Does not take into consideration rostering and special operational requirements.



Staffing Calculations

③ Step 1

- ▶ List all staff for a division or department
- ▶ Worksheet 1 can be used for data entry

③ Step 2

- ▶ Conditions of service and operational data (Worksheet 2)



WORKSHEET 1 - ATS DIVISION PERSONNEL DATABASE

User must enter in the appropriate cells, a '1' = Post

FACILITY CATEGORIES:

AD I

AD II

AD III

AD IV

ACC

NON-OP

STATE OF NOWHERE:

III

II

IA

IA

DOF

DOF

ACC

ACC

H

AI

				III	II	IA	IA	DOF	DOF	ACC	ACC	H	AI
15	9	Chief, Air Traffic Control (ACC)	CAA		0	0	0	0	0	1	0	0	0
16	10	Supervisor, Air Traffic Control (ACC)	SAA		0	0	0	0	0	1	0	0	0
17	11	Supervisor, ATC Technical Specialist (ACC)	SATSA		0	0	0	0	0	1	0	0	0
18	12	Air Traffic Controller, ACC Radar	AAR		0	0	0	0	0	1	0	0	0
19	13	Air Traffic Controller, (ACC Data)	AAD		0	0	0	0	0	1	0	0	0
20	14	Air Traffic Controller, (ACC Non-Radar)	AANR		0	0	0	0	0	1	0	0	0
21	15	Air Traffic Controller Assistant (ACC)	ASA		0	0	0	0	0	1	0	0	0
22	16	ATC Technical Specialist Instructor (ACC)	ATSIN		0	0	0	0	0	1	0	0	0
25	19	Air Traffic Controller, Instructor	AIN		0	1	1	0	0	1	0	0	2
26	20	ATS, Other Designation, Instructor	OTH		0	1	1	0	0	1	0	1	1

B

C

WORKSHEET 2 - ATS STAFFING/OPERATIONAL INPUT DATA

Enter data into Column 'C'. Press [TAB] or [Shift] [Tab] to move between fields. Use File / Save As, to save your work using a new file name. Save in an appropriate Folder.

Description of Data

User Data Input

PERSONNEL DATA

Days per year:

365

Hours per working day:

7.5

Work schedule, Days On:

4

Work schedule, Days Off:

3

Annual leave, Days per year:

30

Average sick days per year:

9

Statutory holidays per year:

12

Average training days per year:

10

Other (days off per year):

2

Breaks per working day (in Hours):

1.5

OPERATIONAL DATA

No. of work positions to be covered:

6

Operation days per year:

365

Operation hours/day:

24

WORKSHEET 3A - ATS FACILITY STAFFING DATA

User data from WS-2 Input ATS

There is NO User data entry into this Worksheet

STAFF WORKING DATA

Data inputted from Data Table

Input Data

Hours per working day (ex. 7:30 Hrs = 7.5 decimal):			7.5	
Work schedule, days on (ex. 5 on, 2 off):			4	
Work schedule, days off:			3	
Annual leave per year:			30	
Average sick days per year:			9	
Statutory holidays per year:			12	
Average days for training per year			10	
Other days Off (not specified)			2	
Breaks per day in hours (briefing, rest etc.)			1.5	

Work week adjustment factor (days on/days off).

Adjustment factor =

G9
G8*G9

0.43

Days per calendar year	365			
Total hours per year:	24	(E19*E20)	8760	hours
Effective available working hours per day		(G7-G15)	6.60	hours
Days off per year (duty rotation)	156.43	function of E19 & (H17)		
Other days off (sum G10, G11, G12, G13 & G14))	63.00			
Total non-operational days		(E22+E23)	219.43	days
Available operational work days per year		(E19-H24)	145.57	days

Staff Working Unit

Available operational work hours per year		(H21*H25)	873	hours
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OPERATIONAL STAFFING DATA

Operational hours per day			24	hours
Operational days per year			365	days
Total facility operational hours per year		(H29*H30)	8760	hours
Operational staffing factor for the facility		(H31/H27)	10.03	
Minimum annual staffing requirement for one position (staffing factor)			10	rounded
Minimum Annual staffing requirement for "x" facilities			6	
Number of positions x Operational staffing factor		(G34*H32)	60.18	
Minimum staff required fc	6	positions	60	staff

	B	C	D	E	F	G	H	I
38	WORKSHEET 3B - SUMMARY OF RESULTS							
39	DETERMINE STAFF WORKING UNIT							
40	Total hours per year (H20)		H20				8760	hours
41	Effective available working hours per day (G7-G15)		H21				6.00	hours
42	Days off per year (due to shift rotation)		E22				156	days
43	Other days off (sum G10, G11, G12, G13 & G14)		E23				63.00	days
44	Total Non-operational days (sum E42, E43)		H24				219	days
45	Available work days per year (E19 - H24)		H25				146	days
46	Available work hours per year: (H21 x H25)		H27				873	hours
47								
48	OPERATIONAL STAFFING DATA (staffing factor)							
49	Operational hours per day		H29				24	hours
50	Operational days per year		H30				365	days
51	Total facility operational hours per year (E19*E20)		H31				8760	hours
52	Operational staffing factor for the facility = H31/H27		H32				10.03	SF
53	Minimum annual staffing requirement for one position						10	rounded
54	Minimum Annual staffing requirement for "x" facilities							
55	Minimum staff required for	6	positions			(Round)	60	staff
56								

Planning Based on Staffing Factor Alone

- ⊙ Does not consider:
 - ▶ **Sector opening/closing times**
 - ▶ **Rostering**
 - ▶ **Other operational factors**
- ⊙ **Minimum staffing data needed**
- ⊙ **Useful when conditions are static**
- ⊙ **Required for more detailed analysis of human resource demand**
 - ▶ **Staff working unit**

Staffing Based on Sector Opening/Closing Times

- ③ Sector opening/closing times based on amount of traffic processed
- ③ Example based on a two-sector ACC
- ③ West sector – non-radar
- ③ East sector – radar
- ③ First extract staff positions required from Worksheet 1

WORKSHEET 4A - ACC - Manned Controller Positions

Enter shift times into cell block C6:D10 (White). Enter Controller numbers into cell block F6:P10.

Press [Tab] or [Shift] [Tab] to move between fields.

Use File | Save As to save your work using a new file name and save in the appropriate folder.

Shifts	Shift Times				West Sector (Non-Radar)											
	Time Period Start	Time Period End	Number of Hours	Total Hrs. Decimal	SAA	SAA Hours	AANR	AANR Hours	ASA	ASA Hours	AIM	AIM Hours	OTH	OTH Hours		
Shift A	0:00	8:00	8:00	8.00	0	0.00	1	8.00	1	8.00	0	0.00	0	0.00	0	0
Shift B	7:45	16:00	8:15	8.25	0	0.00	1	8.25	1	8.25	0	0.00	0	0.00	0	0
Shift C	15:44	23:59	8:15	8.25	1	8.25	1	8.25	1	8.25	0	0.00	0	0.00	0	0
Shift D	7:00	15:00	8:00	8.00	0	0.00	0	0.00	0	0.00	1	8.00	0	0.00	0	0
Shift E	15:00	23:00	8:00	8.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0
	<i>Total controllers/position Hours</i>					8.25		24.5		24.5		8		0		

WORKSHEET 4B - ACC - Manned Controller Positions

Enter shift times into cell block C23:D27 (White). Enter Controller numbers into cell block F6:P10.

Press [Tab] or [Shift] [Tab] to move between fields.

Use File | Save As to save your work using a new file name and save in the appropriate folder.

Shifts	Shift Times				East Sector (Radar)											
	Time Period Start	Time Period End	Number of Hours	Total Hrs. Decimal	SAA	SAA Hours	SATS A	SATSA Hours	AAR	AAR Hours	AAD	AAD Hours	ATSI H	ATSIH Hours	OTH	OTH Hours
Shift A	0:00	8:00	8:00	8.00	1	8.00	1	8.00	1	8.00	1	8.00	0	0.00	0	0.00
Shift B	7:45	16:00	8:15	8.25	1	8.25	1	8.25	2	16.50	2	16.50	0	0.00	0	0.00
Shift C	15:44	23:59	8:15	8.25	1	8.25	1	8.25	2	16.50	2	16.50	0	0.00	0	0.00
Shift D	7:00	15:00	8:00	8.00	0	0.00	0	0.00	0	0.00	0	0.00	1	8.00	0	0.00
Shift E	15:00	23:00	8:00	8.00	0	0.00	0	0.00	0	0.00	0	0.00	1	8.00	0	0.00
Total controllers/position Hours						24.5		24.5		41		41		16		0

B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q		
44	Adjustment Staffing Factor (Days in work week and days worked)								10.03								
45	Operational hour per 24-hour period								24.00								
46	Staff Working Unit								873								

WORKSHEET 4C

Following table indicates total staff required as itimized in the West and East sector worksheets 4A & 4B

	West Sector		East Sector		Total
	Hours	Staff	Hours	Staff	
CAA	0.0	0.0	0.0	0.0	0.0
SAA	8.3	3.4	24.5	10.2	13.7
SATSA	0.0	0.0	24.5	10.2	10.2
AAR	0.0	0.0	41.0	17.1	17.1
AAD	0.0	0.0	41.0	17.1	17.1
AANR	24.5	10.2	0.0	0.0	10.2
ASA	24.5	10.2	0.0	0.0	10.2
ATSIN	0.0	0.0	16.0	6.7	6.7
AIN	8.0	3.3	0.0	0.0	3.3
OTH	0.0	0.0	0.0	0.0	0.0
Total	65.3	27.3	147	61.4	89

Formula

$$\frac{\text{Post position hours/24-hour} \times 365/\text{days}}{\text{Staff Working Unit}} = \text{No. Staff}$$

Example - East Sector

$$\frac{\text{SAA total hours} \times 365}{\text{WS-3 ATS (SF) H27}} = \frac{\text{Cell F53} \times 365}{\text{Cell J46}}$$

$$= \frac{24.5 \times 365}{873}$$

$$= 10.2$$

(rounded) **10 staff**

WORKSHEET 4D - WEST AND EAST SECTOR STAFFING

	West Staff	East Staff	Total
CAA	0.0	0.0	0.0
SAA	3.4	10.2	13.7
SATSA	0.0	10.2	10.2
AAR	0.0	17.1	17.1
AAD	0.0	17.1	17.1
AANR	10.2	0.0	10.2
ASA	10.2	0.0	10.2
ATSIN	0.0	6.7	6.7
AIN	3.3	0.0	3.3
OTH	0.0	0.0	0.0
Total	27.3	61.4	88.7

CNS Maintenance Staffing Requirements



CNS Maintenance Workload

- ③ Inventory of equipment
- ③ Yearly total maintenance requirements expressed in hours for each facility



Steps

- ③ **CNS Division Personnel Database (Worksheet 1)**
- ③ **CNS Staffing Data Input (Worksheet 2)**
- ③ **CNS Staffing Data Calculations (Worksheet 3)**
- ③ **Equipment inventory**
- ③ **Determine maintenance requirements – “task-load”**
- ③ **Determine minimum staff required**
- ③ **Rostering**



	B	C	D	E	F	G	H	I	J
2	CNS MAINTENANCE DIVISION								
3	OPERATIONAL EQUIPMENT INVENTORY								
4	ID Number	EQUIPMENT	IIT. Airport Alpha (1)	IIT. Airport Beta (1)	ACC En-route	Domestic Airport Grade I (4)	Domestic Airport Grade II (6)	Repair and Overhaul + TRAINING	Quantity
5	<div style="border: 1px solid black; padding: 5px; background-color: #ffff00;"> Enter data into Block D7...J19. Press [Tab] or [Shift] [Tab] to move between fields. Use File Save As to save your work using a new file name and dsave in the appropriate folder. </div>								
6	1.0	Communication Equipment							
7	1.01	HF Transmitters			6				6
8	1.02	VHF Transmitters	8	8	10	24	24	2	76
9	1.03	HF Receivers			6				6
10	1.04	VHF Receivers	8	8	10	24	24	2	76
11	1.05	HF Transceivers			4				4
12	1.06	VHF Transceivers	5	5	8	18	18	2	54
13	1.07	VHF Hand-held Transceivers	10	10				4	24
14	1.08	HF Antenna System			1				1
15	1.09	VHF Remote Control Air/Ground	0	0	5	0	0		5
16	1.10	Microwave Radio Link System	2	1	2				5
17	1.11	VSAT Satellite Station	1	1	3				5
18	2.0	Message Switching Centre							
19	2.01	AFTN Automatic Switch	1	1	1				3
20	2.02	Concentrator/Terminal Equipment				4	6	2	12
WS-3 (Inv) / WS-4 (PM) / WS-5 (CM) / WS-6 (PMT) / WS-7 (CMT) / WS-8 (Mntc.WL) / WS-9									

**A facility “task-load” factor
is the yearly total
maintenance requirements
expressed in hours for each
facility.**

Calculate Total Maintenance Time per Facility

- ③ Preventative
- ③ Corrective
- ③ Flight calibration
- ③ Modifications, installations, etc.
- ③ Travel Time
- ③ Remote Control and Monitoring Systems?

CNS MAINTENANCE DIVISION

PREVENTATIVE MAINTENANCE DATA

ID Number	EQUIPMENT	Daily PM (Hours x 365)	Weekly PM (Hours x 52)	Monthly PM (Hours x 12)	Annual PM (Hours x 1)	Unit-totals Yearly PM (Hours)	Total Yearly PM (Hours)
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Enter data into Block D11...G54 (daily, weekly, monthly and annual preventative maintenance). Press [Tab] or [Shift] [Tab] to move between fields. Use File | Save As to save your work using a new file name and save in the appropriate folder.

1.0	Communication Equipment						
1.01	HF Transmitter	0	0.5	1	2	40	
1.02	VHF Transmitter	0	0.5	1	2	40	
1.03	HF Receivers	0	0.5	1	2	40	
1.04	VHF Receiver	0	0.5	1	2	40	
1.05	HF Transceiver	0	0.5	1	2	40	
1.06	VHF Transceiver	0	0.5	1	2	40	
1.07	VHF Hand-held Transceivers	0	0.5	0.5	1	33	
1.08	HF Antenna System	0	0.5	0	4	30	
1.09	VHF Antenna System	0	0.5	0	4	30	
1.10	Microwave Radio Link System	0.5	1	2	6	264.5	
1.11	VSAT Satellite Station	0.5	1	2	6	264.5	
	Total Comm.						862

WORKSHEET 11 - CNS MAINTENANCE DATA

Simple Analysis of Human Resource Requirement

No data is entered by the user in this worksheet.
For information only.

1.0	From Worksheet WS-3 (SF)	
	<i>Staff Working Unit</i>	558
	<i>Minimum annual staffing for one position/facility (Cp. Staffing Factor)</i>	8.78
	<i>Operational days per year</i>	365.00
	<i>Total facility operational hours per year</i>	8760
	<i>Effective hours per day, active operational (H19-H20):</i>	6.5
2.0	Total "Task-load" for Electronic Maintenance Facilities	Task-Loads
2.1	Communication Equipment: From Worksheet WS-9 (Cell D6)	
	Total "Task-load" for communications equipment =	14,675
2.2	Message Switching Centre: From Worksheet WS-9 (Cell D7)	
	Total "Task-load" for message switching equipment =	1,122
2.3	Navigation Aids: From Worksheet WS-9 (Cell D8)	
	Total "task-load" for navigation aid equipment =	7,255
2.4	Radar: From Worksheet WS-9 (Cell D9)	
	Total "task-load" for radar equipment =	3,989
2.5	Miscellaneous: From Worksheet WS-9 (Cell D20)	
	Total "Task-load" for miscellaneous equipment =	559
2.6	Total "Task-load" for all Equipments/Facilities =	27,599
3.0	Determine the minimum staff required each category:	
	<i>Using the Formula:</i>	
	<i>Minimum number of personnel required =</i>	<u>Staff</u>
		<i>Task-load Unit</i>
		<i>Staff Working Unit</i>
3.1	Staff required for communication facilities: 113/g6	15
3.2	Staff required for AFTN message switching facilities: 115/g6	1
3.3	Staff required for navigation aid facilities: 117/g6	7
3.4	Staff required for radar facilities: 119/g6	4
3.5	Staff required for miscellaneous facilities: 121/g6	1
3.6	Minimum number of staff required for all categories:	28

Other Considerations

③ Maintenance philosophy

- ▶ Module or component level maintenance
- ▶ Remote control and monitoring systems
- ▶ Maintenance levels

③ Rostering (ex. need for technician on a 24 hour basis)

③ Use of partially qualified staff

