WEAPON SYSTEM PERFORMANCE INDICATORS - OSD SUSTAINMENT KPPs

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Roy E. Rice, Ph.D., P.E.

Chief Technologist,

Teledyne Brown Engineering

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BROWN ENGINEERING, INC.
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OUTLINE

- Purpose of Metrics
- Concerns and Issues
- OSD Sustainment Metrics
- Example metrics for Different Purposes

PURPOSE OF METRICS

- Influence design
- Track performance
- Manage Programs
- Motivate behavior
- Fix accountability
- Compare systems
- Perform analysis
- Report Status

No one metric or set of metrics accomplishes all these in Sustainment!

Ultimately, metrics are used to inform decisions!!!
The question is…what are the decisions?

CONCERNS AND ISSUES

- Different metrics needed in various phases of Life Cycle
  - ORDS and Capability Documents
    - Wartime metrics, threat driven, OPTEMPO dependent – drive design
  - PBL
    - Peacetime metrics, resource constrained, incentivize and hold PSI accountable
  - Readiness Reporting
    - Ready For Tasking (RFT – US Navy)
    - SORTS
- Different metrics are needed by different systems
  - Systems that operate constantly vs. periodic operation
- Different metrics are needed by different decisionmakers
  - Programmatic, operational, financial
- Different metrics are needed for different purposes

OSD SUSTAINMENT METRICS

- Materiel Availability
- Materiel Reliability
- Ownership Cost
- Mean Downtime

Purpose??

- Influence design
- Track performance
- Manage Programs
- Motivate behavior
- Fix accountability
- Compare systems
- Perform analysis
- Report Status

REST OF THE BRIEFING

- "Number One" Rule for establishing ***any*** metrics
- General Concerns
  - Context for Metrics
  - Definitions/equations
  - Strengths and Weaknesses
  - Candidate Metrics
- Fighter Aircraft
  - Metrics to cover full spectrum
- Readiness/Availability
- Linkages of the Metrics
- Summary
- PBL Linkages
- Current KPP Issues

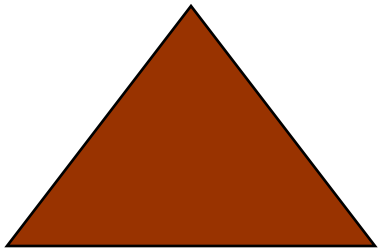
"NUMBER ONE" RULE FOR ESTABLISHING ***ANY*** METRICS!

- ***FIRST***, describe or define what you want to measure
  - Verbalize it…draw a picture of it
  - Define the problem
  - Describe the tasks you are required to perform (capabilities)
  - Do not label…don't try to name it first
  - Describe boundary conditions, GR&A, processes
  - Don't jump directly to equations
  - Don't necessarily try make other metrics fit it
  - Detail what you're trying to accomplish and then describe metrics that would let you know when you've accomplished it

FIGHTER AIRCRAFT METRICS - ORD

Sortie Generation Rate (SGR) –
measures OPTEMPO

-Hrs/month
-Miles/month
-Operating time/month
-Steaming days/month

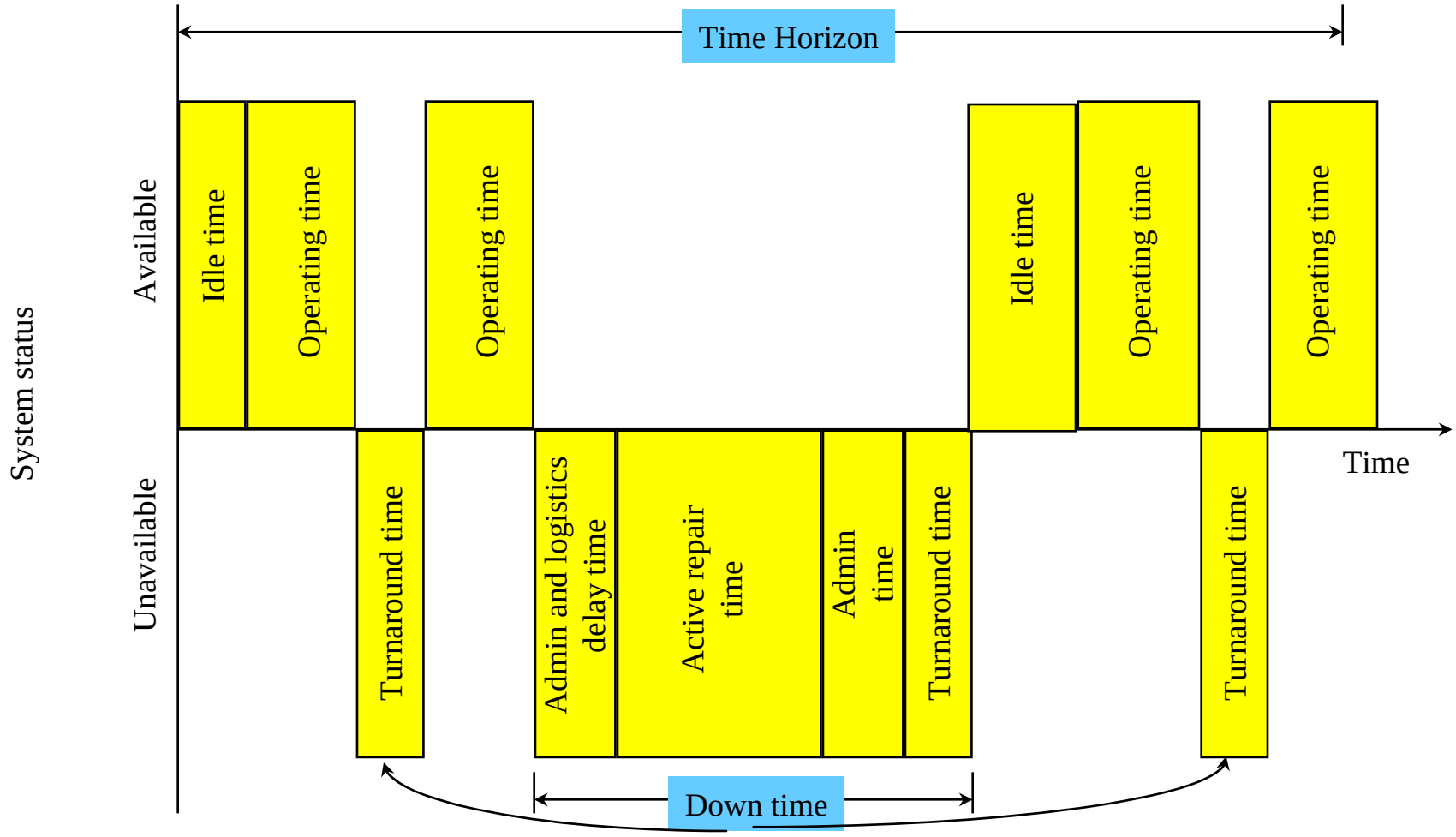


Logistics Footprint (LF) –
measures how much "stuff" is required to support wartime operations

Mission Reliability (MR) –
measures effectiveness of mission

1. It doesn't break very often,
2. When it does break, we can fix it quickly
3. We don't have to take a lot of stuff with us to accomplish this

AVAILABILITY



AVAILABILITY MEASURES

Inherent Availability (A_i) = $\dfrac{\text{MTBF}}{\text{MTBF + MTTR}}$

Accounts for operating (flying) time and active repair time ***only*…used in Specs.**

Operational Availability (A_o) = $\dfrac{\text{MTBF}}{\text{MTBF + MTTR + MLDT}}$

Accounts for operating time ***only*…good for systems that operate continuously.**

MC Rate = $\dfrac{\text{Uptime}}{\text{Uptime + Downtime}}$

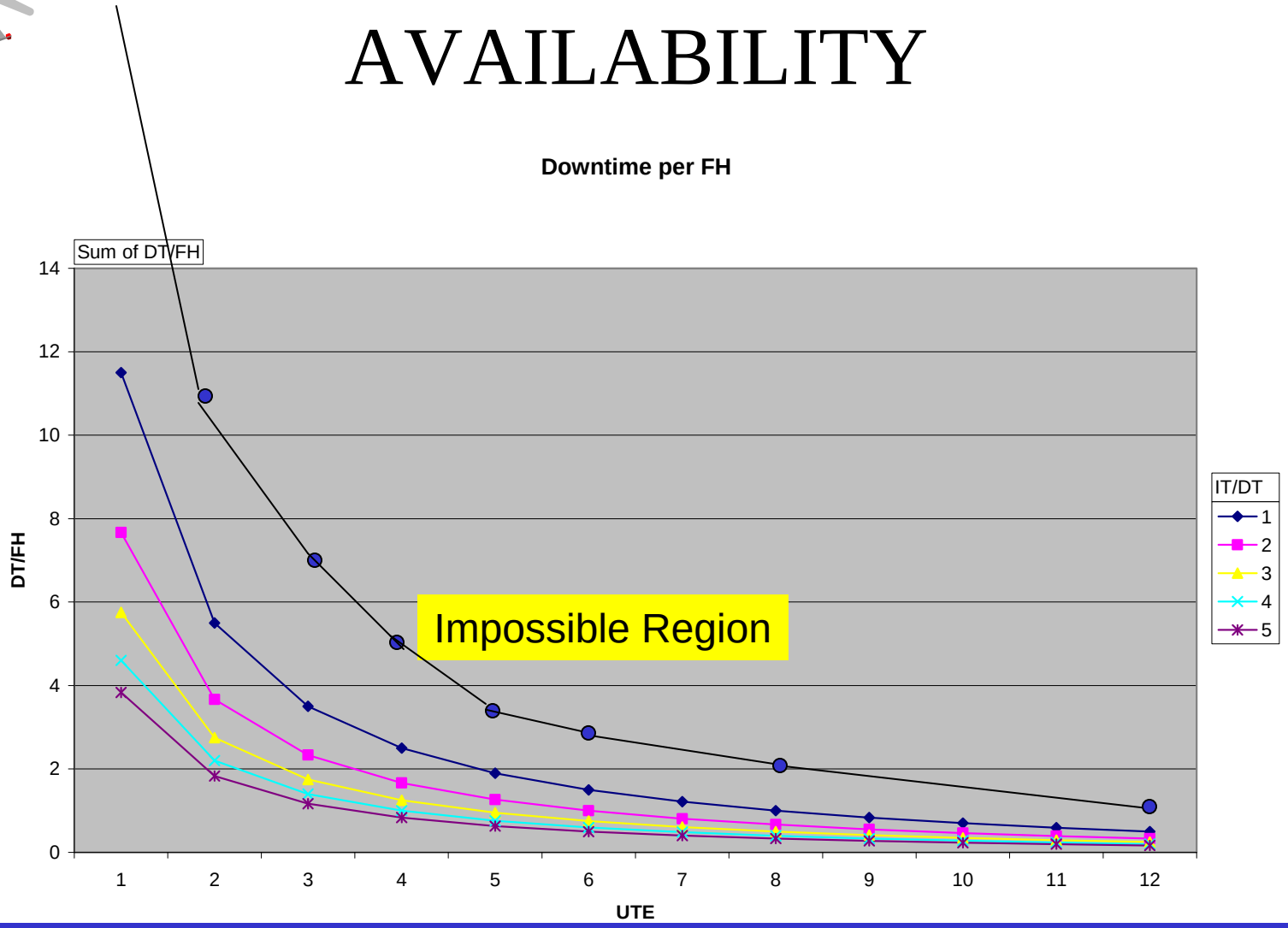
= $\dfrac{\text{FH + IT}}{\text{FH + IT + DT}}$

**This "IT" is … some of the a/c (lower UTE for fighters) that are available BUT just sitting on the ramp ready for next sortie.

FH = Flying Hours
IT = Idle Time
DT = Downtime
UTE = Flying Hours per day

Accounts for flying time ***and idle time***

AVAILABILITY

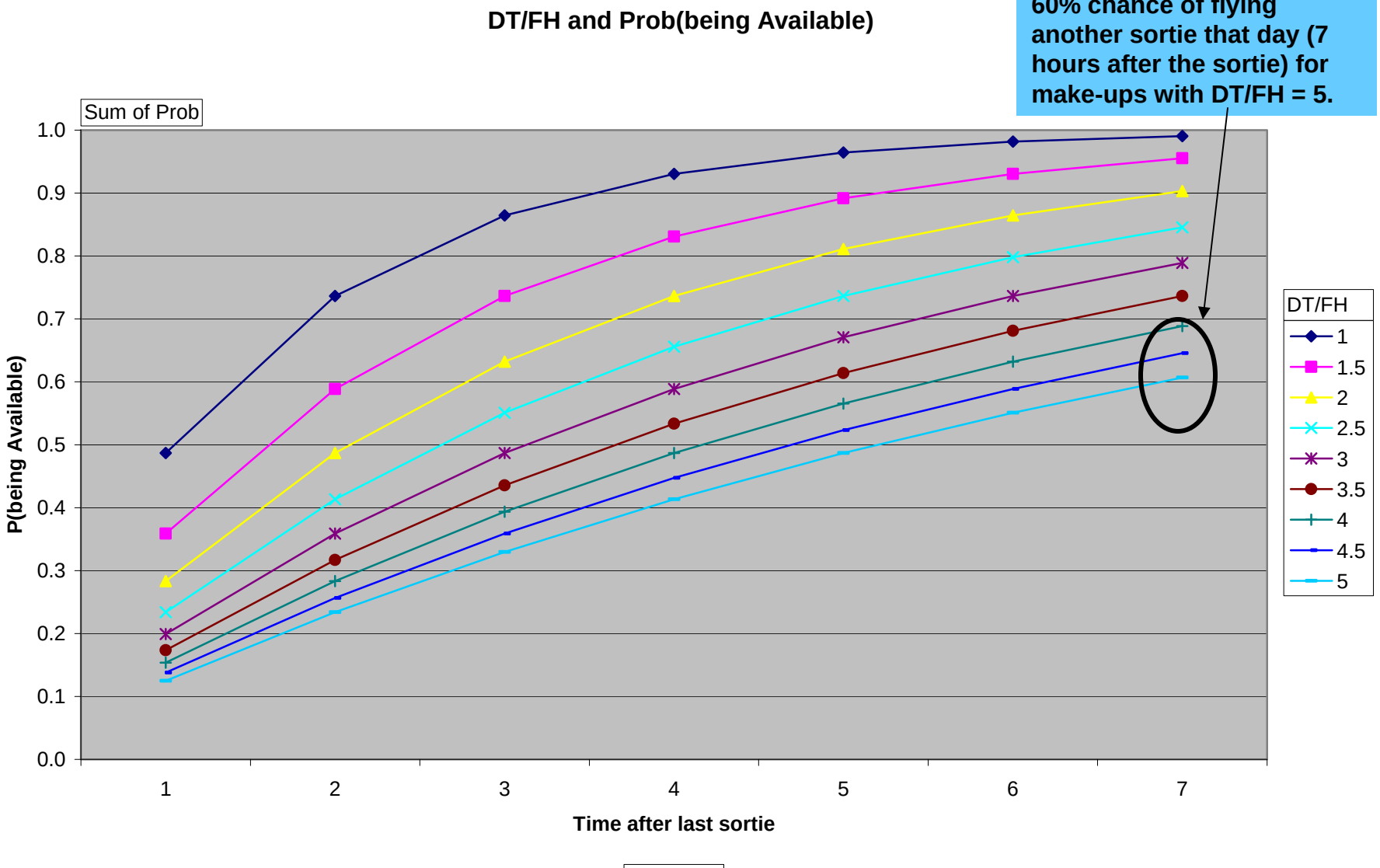


(1) If an aircraft is going to need higher UTE, it will need to have much less DT/FH

(2) If an aircraft is going to keep the same UTE and lower its IT/DT ratio, it can live with higher DT/FH.

DT/FH and Training Sorties

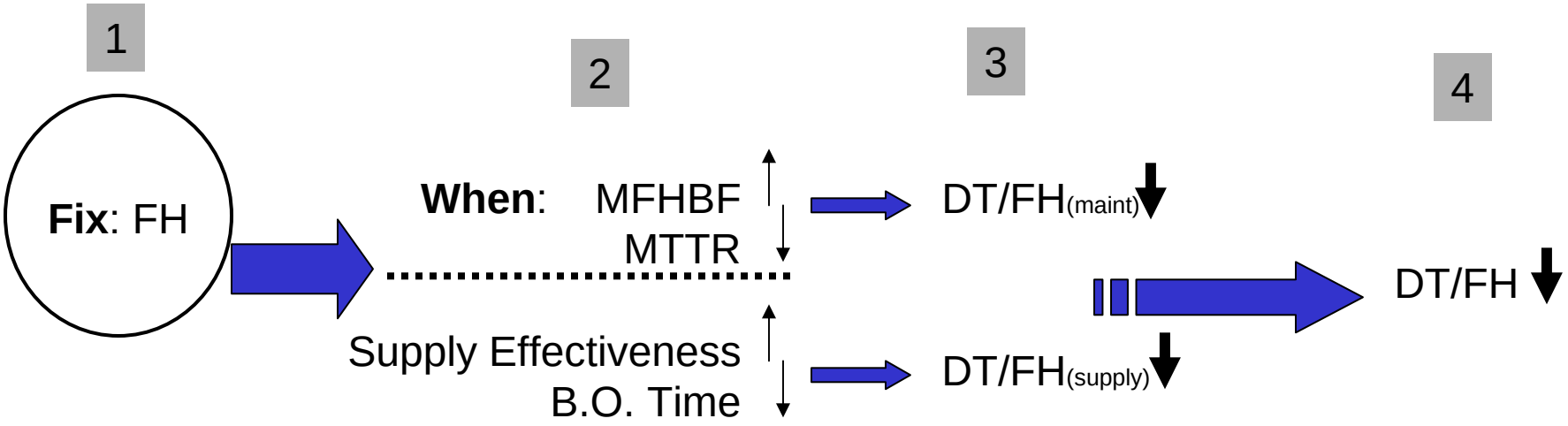
After a 1.5 hour sortie in the morning, there is barely a 60% chance of flying another sortie that day (7 hours after the sortie) for make-ups with DT/FH = 5.

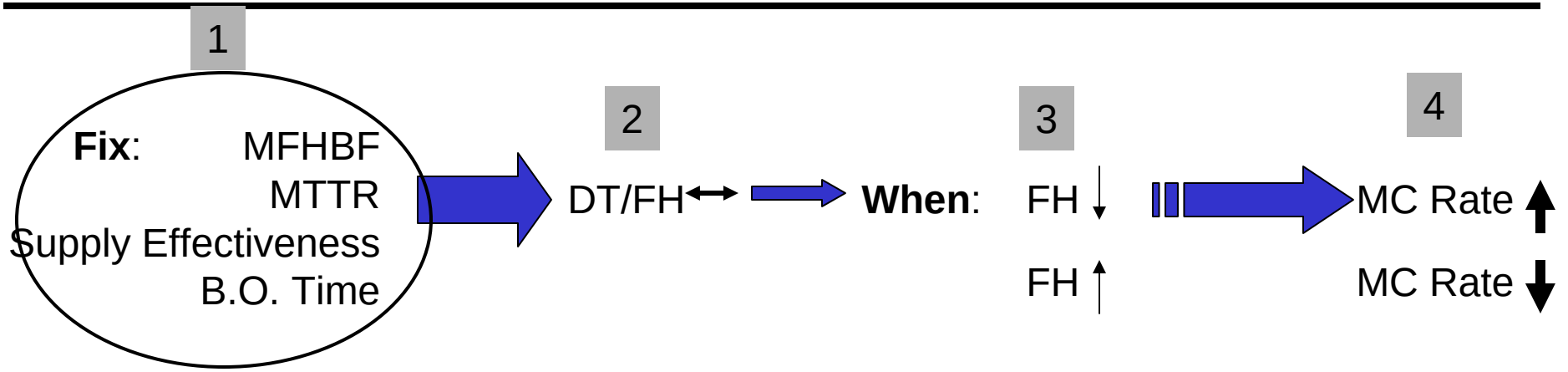


Deriving DT/FH

- More meaningful metric for Availability
- Can be used to obtain other metrics
- Doesn’t have to be “*Flying* Hours”, it can be “*Operating* Hours”
- Use a “2-part” Nomogram
- Step-by-step walk through…

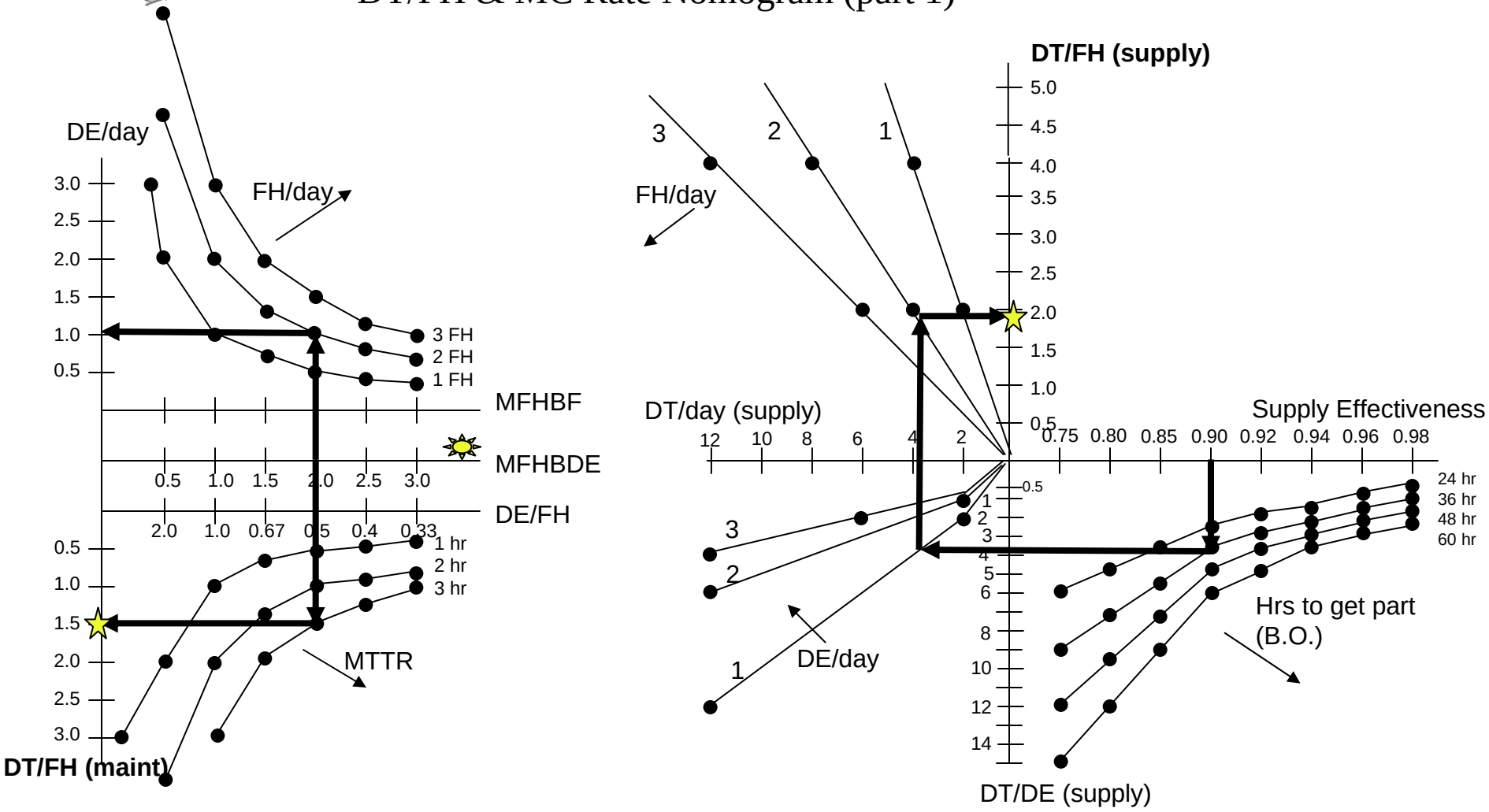
GENERAL RELATIONSHIPS





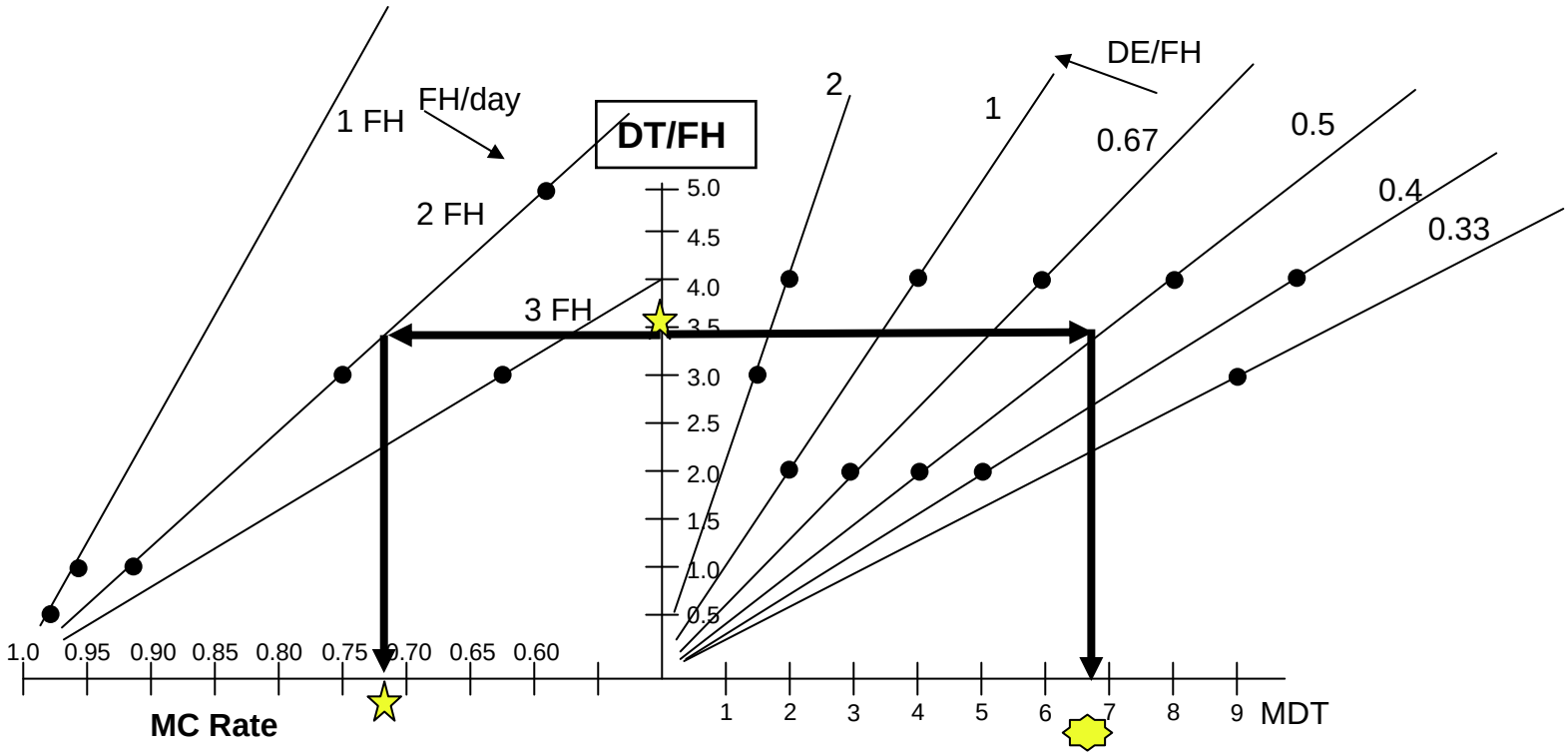
With FH held constant, contractor can impact DT/FH only. When FH are not held constant, MC Rate can "move" without contractor influence.

DT/FH & MC Rate Nomogram (part 1)



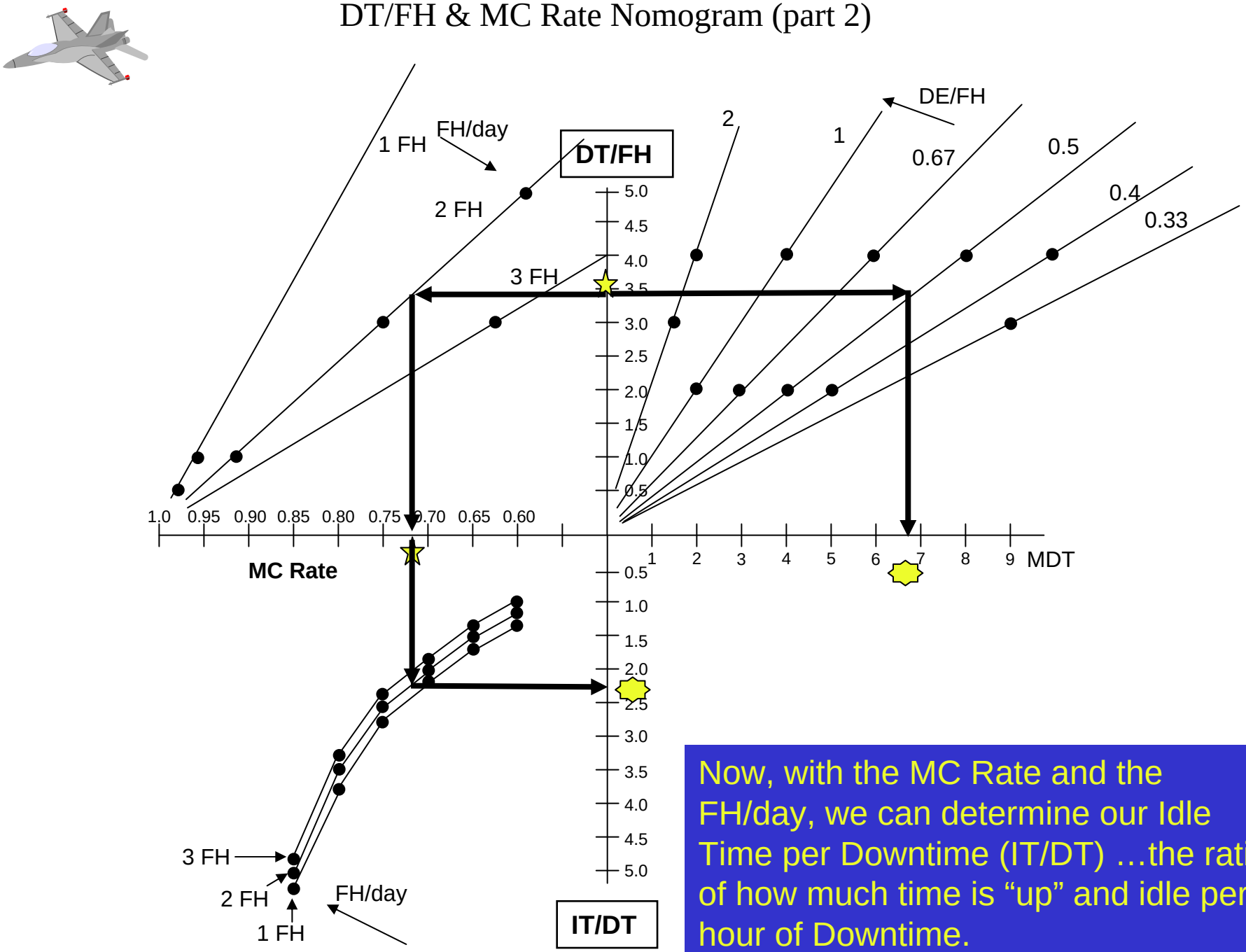
Now we have the maintenance and the supply contribution to total DT/FH.

DT/FH & MC Rate Nomogram (part 2)



Now, with the DT/FH and the FH/day, we can determine our MC Rate…defined as (Uptime)/(Uptime + Downtime).

DT/FH & MC Rate Nomogram (part 2)



Now, with the MC Rate and the FH/day, we can determine our Idle Time per Downtime (IT/DT) …the ratio of how much time is "up" and idle per hour of Downtime.

Which Would You Rather Have?

DT/FH Current Fleet
3-Dec-07

	744	720	744	744	720	744	720	744	744	672	744	720	744	720	744	744	720	744		
	6-May	6-Jun	6-Jul	6-Aug	6-Sep	6-Oct	6-Nov	6-Dec	7-Jan	7-Feb	7-Mar	7-Apr	7-May	7-Jun	7-Jul	7-Aug	7-Sep	7-Oct		
#a/c	176	175	175	175	175	175	174	174	174	174	174	174	174	173	173	170	168	165	**AVG**	
MC	0.755	0.769	0.783	0.797	0.777	0.782	0.792	0.803	0.794	0.772	0.787	0.787	0.751	0.72	0.75	0.733	0.751	0.769	0.77	MC
FH	3406	3301	3495	3899	3068	3761	3286	3207	3309	3393	3872	3476	3755	4167	3940	4437	3078	3602	3580.67	FH
FH/ac	19.35	18.86	19.97	22.28	17.53	21.49	18.89	18.43	19.02	19.50	22.25	19.98	21.58	24.09	22.77	26.10	18.32	21.83	20.68	FH/ac
FH/ac/day	0.62	0.63	0.64	0.72	0.58	0.69	0.63	0.59	0.61	0.70	0.72	0.67	0.70	0.80	0.73	0.84	0.61	0.70	0.68	FH/ac/day
DT/ac	182.28	166.32	161.45	151.03	160.56	162.19	149.76	146.57	153.26	153.22	158.47	153.36	185.26	201.60	186.00	198.65	179.28	171.86	167.84	DT/ac
DT/FH	9.42	8.82	8.08	6.78	9.16	7.55	7.93	7.95	8.06	7.86	7.12	7.68	8.58	8.37	8.17	7.61	9.79	7.87	8.16	DT/FH

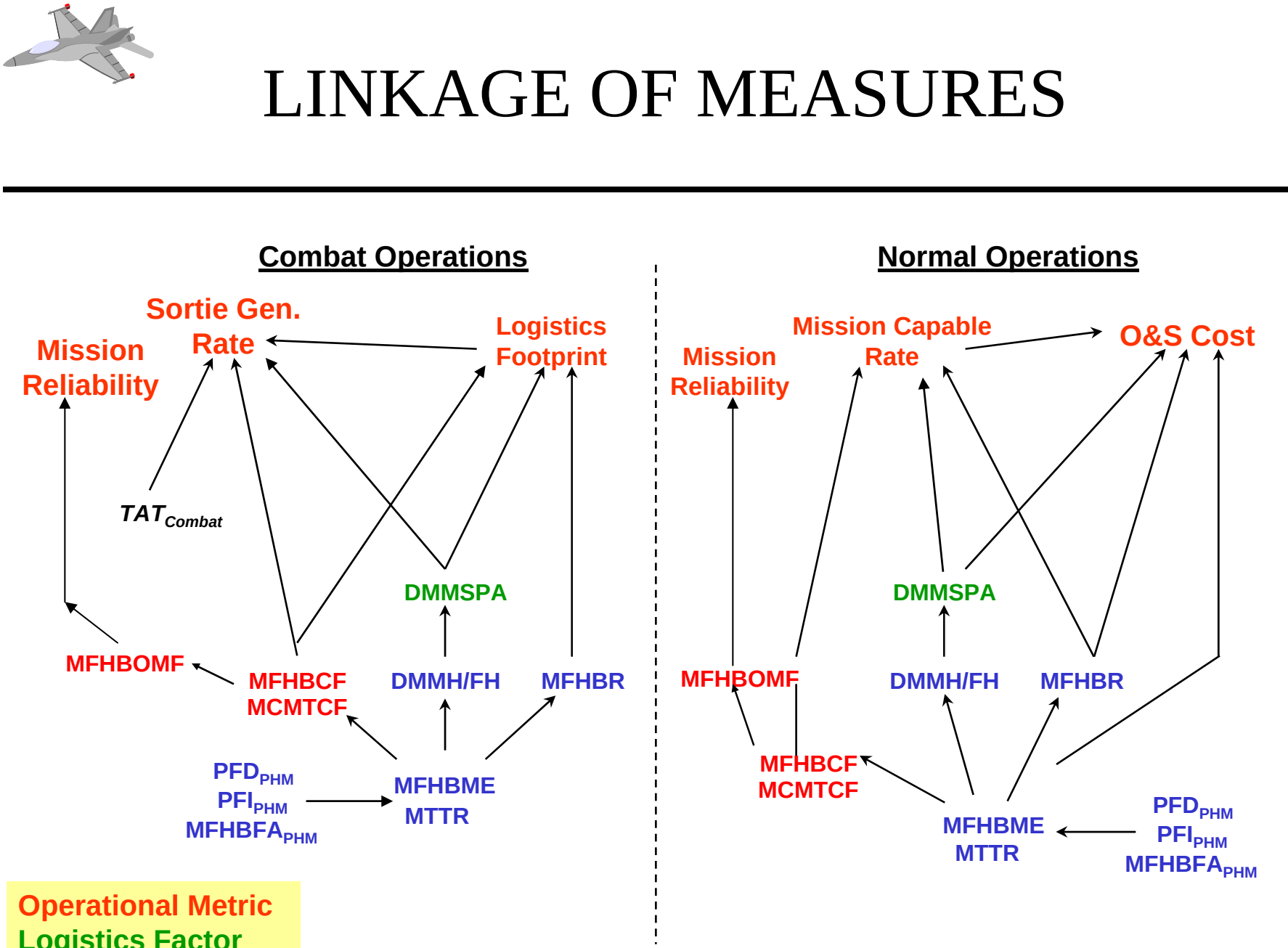
	744	720	744	744	720	744	720	744	744	672	744	720	744	720	744	744	720	744		
	6-May	6-Jun	6-Jul	6-Aug	6-Sep	6-Oct	6-Nov	6-Dec	7-Jan	7-Feb	7-Mar	7-Apr	7-May	7-Jun	7-Jul	7-Aug	7-Sep	7-Oct		
#a/c	87	87	86	87	87	87	87	87	87	87	87	87	87	87	87	85	85	83	**AVG**	
MC	0.761	0.749	0.763	0.751	0.737	0.774	0.735	0.713	0.732	0.712	0.781	0.841	0.732	0.77	0.708	0.725	0.75	0.742	0.75	MC
FH	3934	3730	3620	3748	2742	3444	3076	3796	3762	3454	4564	3752	3620	4148	3448	4154	3072	3790	3658.56	FH
FH/ac	45.22	42.87	42.09	43.08	31.52	39.59	35.36	43.63	43.24	39.70	52.46	43.13	41.61	47.68	39.63	48.87	36.14	45.66	42.30	FH/ac
FH/ac/day	1.46	1.43	1.36	1.39	1.05	1.28	1.18	1.41	1.39	1.42	1.69	1.44	1.34	1.59	1.28	1.58	1.20	1.47	1.39	FH/ac/day
DT/ac	177.82	180.72	176.33	185.26	189.36	168.14	190.80	213.53	199.39	193.54	162.94	114.48	199.39	165.60	217.25	204.60	180.00	191.95	183.95	DT/ac
DT/FH	3.93	4.22	4.19	4.30	6.01	4.25	5.40	4.89	4.61	4.87	3.11	2.65	4.79	3.47	5.48	4.19	4.98	4.20	4.42	DT/FH

DT/FH is a more informative/meaningful Metric!

DISCUSSIONS ON COMPARISONS

- To compare MC rates on different aircraft is risky
  - Driven by tempo (UTE)
  - Holding tempo (UTE) constant for both aircraft is not realistic…PLUS, this just reduces to comparing Ao
  - MC is a function of too many variables
- To compare Ao is also dangerous
  - The many users (across services) rejected using Ao as a measure of readiness/availability because it doesn't reflect tempo
- Better measure is a combination of measures (KPPs)
- We should encourage a comparison based on basic measures - Reliability, maintainability, MMH/FH

LINKAGE OF MEASURES



Operational Metric
Logistics Factor
Engineering Metric

LRIP I PBL METRICS

Air System PBL Metrics	Propulsion PBL Metrics
• Readiness/Availability – Aircraft Availability (MC)	• Engine Not Mission Capable Supply (E-NMCS) • Engine Not Mission Capable Maintenance (E-NMCM) • Time on Wing (T.O.W)
• Mission Effectiveness (ME)	• Engine Mission Abort Rate
• Sorties & FH Flown – PSF – PFHF	• N/A for LRIP I
• Log Footprint (LFD)	
• Military (Logistics) Level of Effort – CANSPTFH – MMH/FH (aggregate) – MMH/FH (subsystem)	• CANSPTFH • MMH/FH (propulsion system)

CURRENT KPP ISSUES

- KPPs for development vs. PBA/PBL metrics for sustainment
  - KPPs – capabilities in wartime (modeled as “what we can expect”)
  - PBA/PBL – actual performance in peacetime (what was achieved not modeled)…tracking 24/7 status
  - Not sure why we have to have SAME metrics throughout Life Cycle…as long as they’re linked and trackable.
- Purpose of PBL – pay for *usage*…not *breakage*.
  - Accountability and incentivization for improvement
  - NOT to be used to verify ORD compliance
  - NOT a substitute for OT&E
- Availability/readiness (peacetime vs. wartime)
  - Key is how to account for “idle time”.
- Contract for “cost”…”cost” is not a metric.

WHAT DO YOU WANT KPPs TO MEASURE?...describe, not label

- Drive the design towards for *wartime capability*:
  - How much operational usage I need or can get (maximize).
  - How often it breaks (minimize).
  - How long it takes return it to “up” status (minimize).
  - How much stuff it takes to support it (minimize).
- Track to PBL *peacetime performance*:
  - Structure for diagnosis and remediation…incentivization.
  - How much time available/ready (maximize).
  - How effective was its operation (maximize).
  - What level of effort it took to support (minimize).
  - Did we get the required usage.
  - Are we getting adequate performance for $/usage.
- Report Status – Fleet Readiness Reporting
  - Is the “unit” ready.
  - Does the inventory meet the allotment.

Ultimately, metrics are used to inform decisions!!!
The question is…what are the decisions?