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**INNOVATION CELL
ENGINEERING SOLUTIONS FOR
FLEET READINESS CENTERS**

Background

- The US Navy's NAE has in its inventory slightly more than **3,700 aircraft** (we had over 6500 in 1990). There are more than 90 T/M/S (type/model/series) aircraft in the Navy and US Marine Corps inventory.
- The NAE (both Navy & Marine Corps) fly more than **1.2 Million flight hours per year at a cost averaging a bit over \$4,400 dollars per hour.**
- From a sustainment standpoint, the cost to provide everything it takes to enable and provide this level of **operations and associated maintenance, logistics and engineering exceeds \$ 6 Billion dollars per year** (not including new /replacement aircrafts and associated systems) and many thousands of highly skilled people of various skills

Challenge

- The Naval Aviation Enterprise (NAE) is under extreme pressure to achieve ‘more Cost-Wise-Readiness’. This is a result of a clear understanding that the strain on our Navy / Marine Corps NAE during current times is extreme and that many of our aircraft, associated weapons systems, and the systems that support them are getting older and must be replaced and/or modernized. With this in mind, it is imperative that the Navy, and **specifically the NAE, seek innovative ways to change the way things are done in order to achieve more ‘effectiveness and efficiency’ in a manner such that resource dollars can be freed up for modernization.** The objective has to be to achieve exactly the right degree of readiness; i.e, not too much, not too little. The NAE ‘is’ in fact doing this.

Transformation to FRCs

- The Naval Aviation Enterprise (NAE) is transforming the way it performs its Depot and non-deployable Intermediate levels of maintenance by adopting the Fleet Readiness Center (FRC) concept. In fact, this initiative was a part of the Base Realignment And Closure (BRAC) process accomplished 2005.

- Per GAO analysis, the FRC initiative, if fully implemented in a successful manner, will provide the highest recurring cost saving of any of the 198 DoD BRAC 2005 initiatives (ref: GAO-rpt-159 dated Dec2007 see page 54).

- The FRC initiative, during it's first two years of implementation, has achieved it savings / cost avoidance targets and these have been reported to Navy leadership as well the GAO.

- In this regard, ideas such as the ADAT experiment are one of more than a

Avionics Rapid Action Team

- Addressing the thinking and efforts of the NAE (Naval Aviation Enterprise) to improve the way we are ‘providing timely engineering and logistics support’ to aviation Fleet Readiness Centers that accomplish the level II and level III aviation maintenance that supports the Navy’s operating aircraft and the associated weapon and support systems.

- The ‘Imagineering’ associated with the ARAT (Avionics - Rapid Action Team) is to deliver to the FRC’s, ‘expedited and focused engineering’ based upon ‘boots in the shop’ and a direct and symbiotic relationship that changes the way we identify, then correct deficiencies including the alteration of the associated business and maintenance processes. This includes ‘enhancing cost effectiveness’, but also ‘system performance’ plus ‘system reliability’ or ‘time-on-wing’.

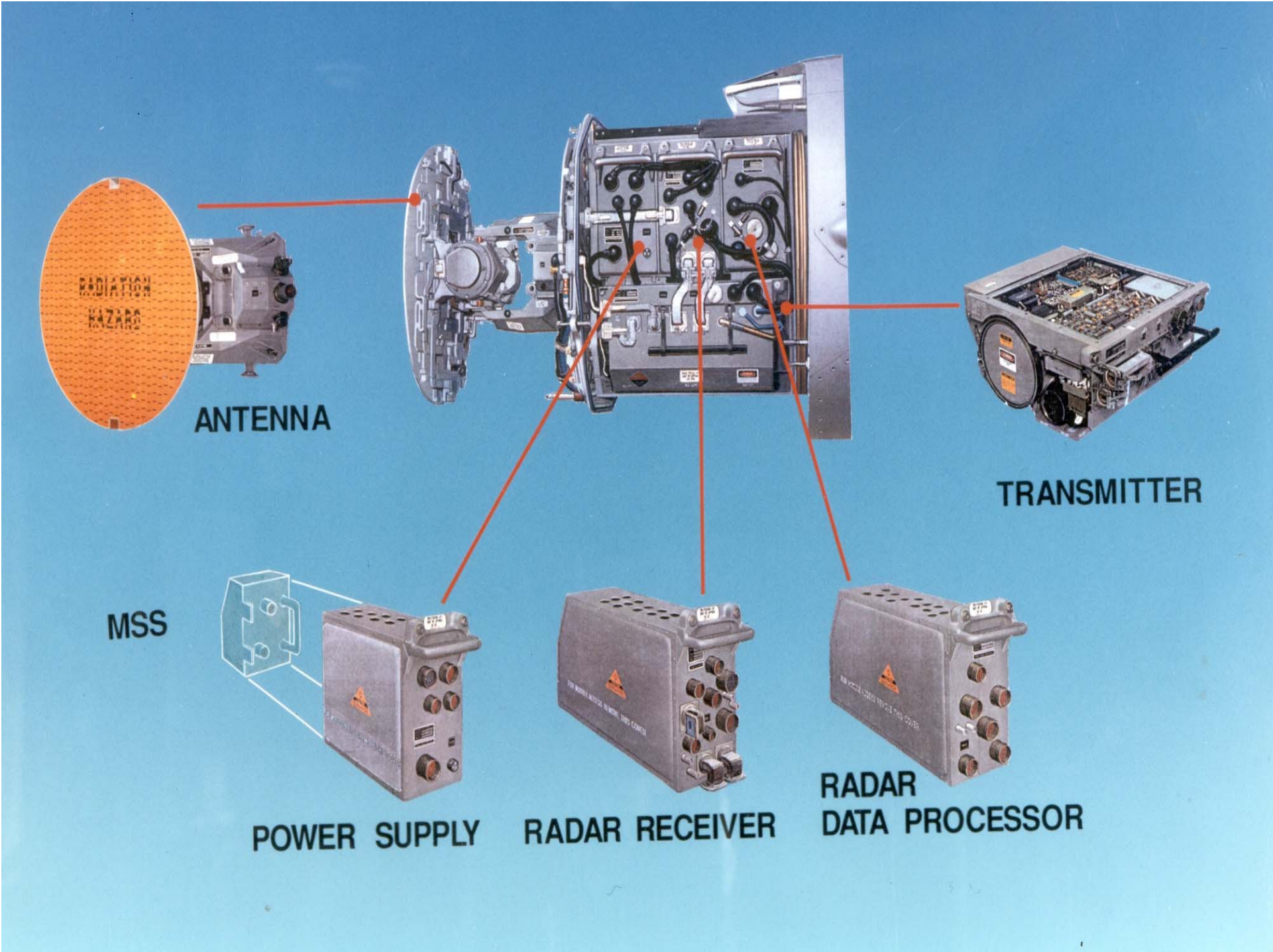
- Key to this effort is the ‘measurement’ of what is or is not being accomplished as well as how the changes were made and can be replicated and sustained.

Exploration

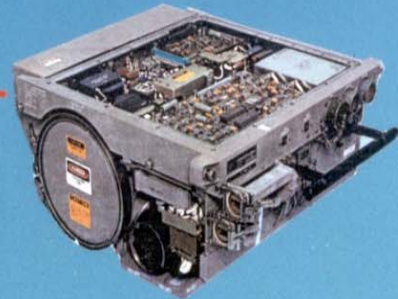
- will provide an explanation of what has been achieved through ARAT at FRC West located at Lemoore California while working on FA-18 radar systems
- While ARAT 'is' focused on specific achievements related to improvements in the domain of the FA-18 Hornet radar, the prime objective is to prove the hypothesis that improvements are possible to the methods the NAE uses to provide logistics, engineering and maintenance support.

ARAT/COE



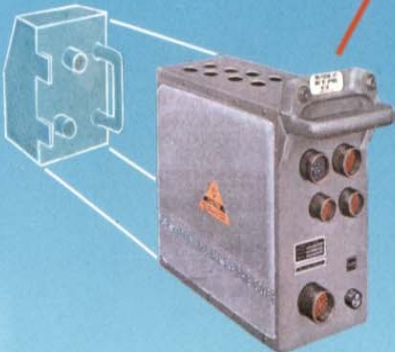


ANTENNA



TRANSMITTER

MSS



POWER SUPPLY



RADAR RECEIVER



**RADAR
DATA PROCESSOR**

ARAT Innovation Cell Approach

- Innovation Cell was created to:
 - Identify/Solidify Objectives
 - Determine Appropriate Means of Measurements
 - Generate Approaches to meet Objectives
 - Measure Results
- Many areas covered for Objectives and were boiled down to two primary measure of effectiveness:
 - Time On Wing (TOW) & affects to RFT
 - Cost Avoidance /Savings

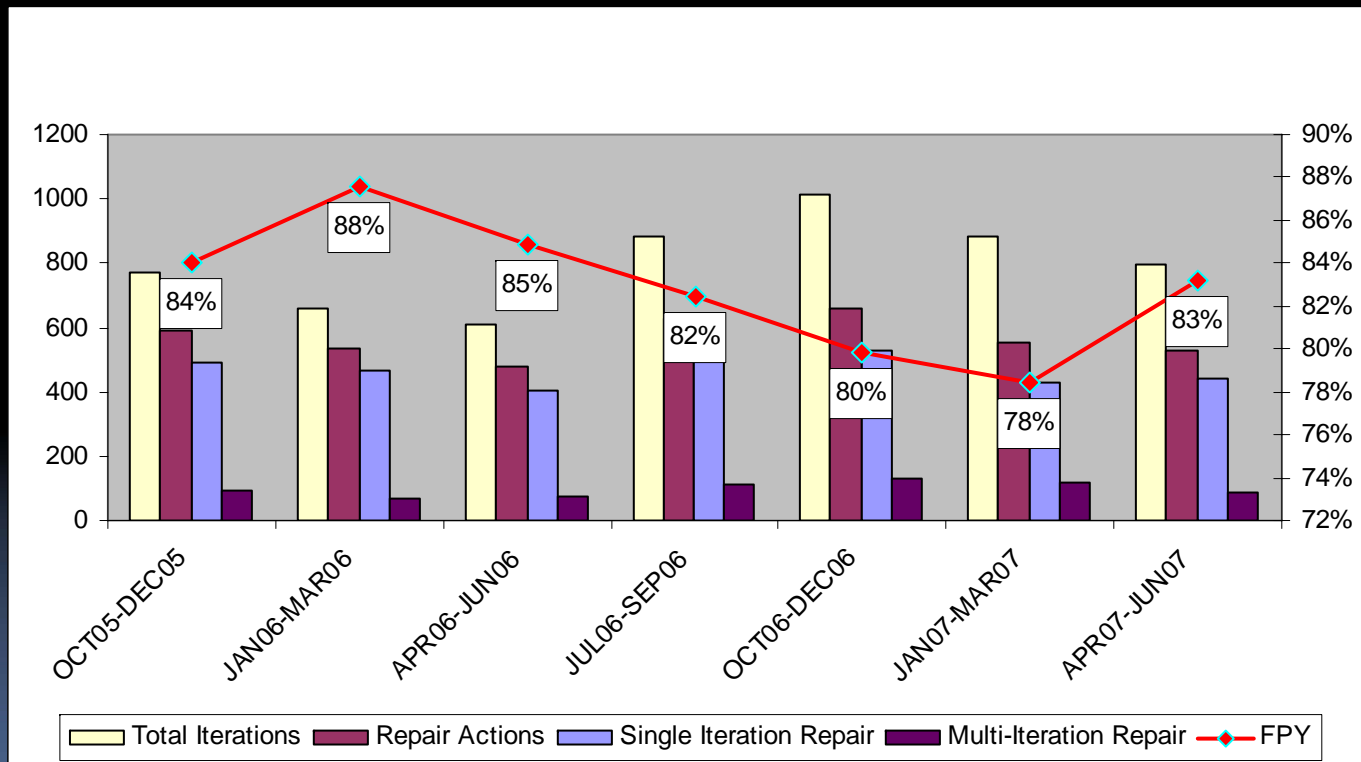
Measurements/Metrics Elements

•Contributing Elements which are readily measurable and being monitored include:

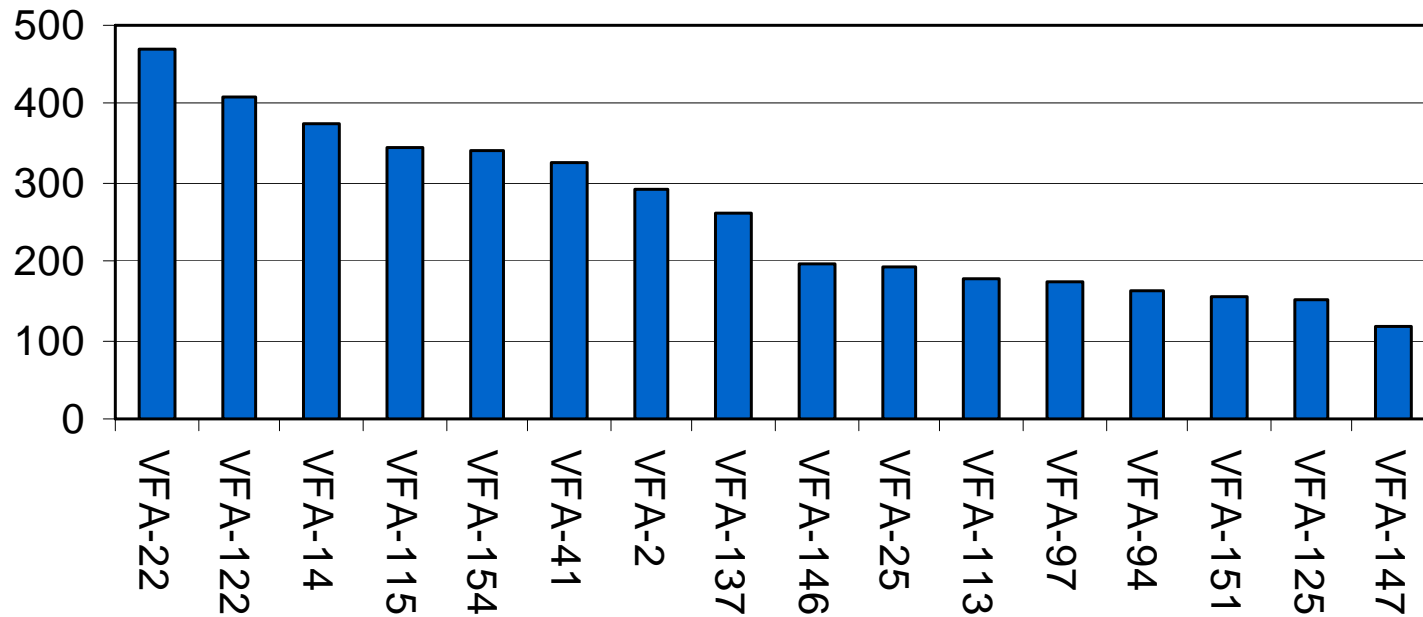
- WIP
- FPY
- A799
- XREPS
- Training
- Parts Availability (AWP)
- CASS Ao
- TPS Ao
- BCMs
- CNV/CND

Actual Statistics on slide 42-50

First Pass Yields



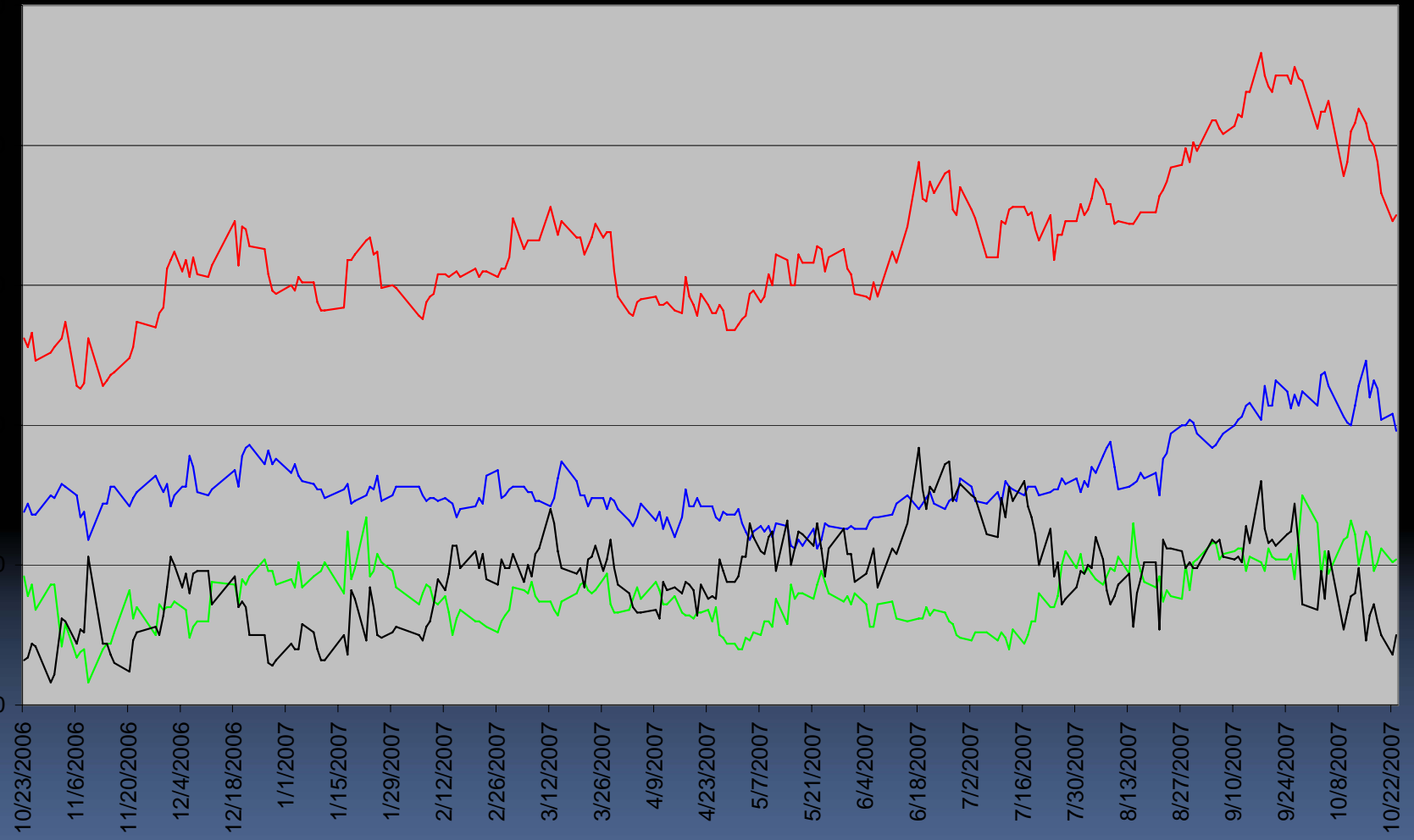
ANT TOW 05-07 AVG



*FY-07 QTR2

A799 Rates Unacceptable & Opportunity for EVHMS

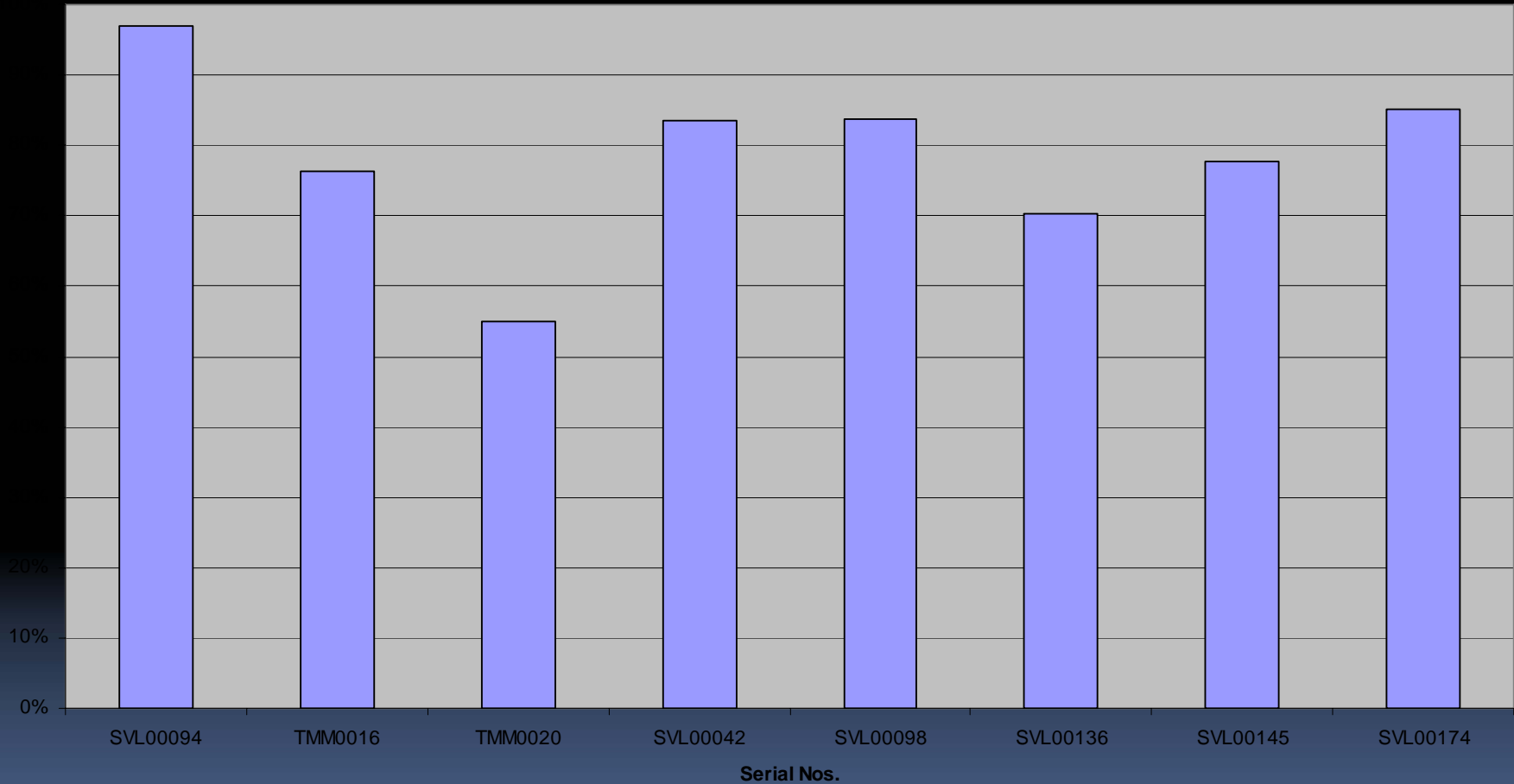
- XMTRs: A799s + Reseat Actions = 51.4 % of IMAs.
- ANTs: A799s + Adjust/boresight/aligned Actions = 55.2 % of IMAs.
- RRs: A799s + Reseats + 2A9s alignments = 54.5 % of IMAs.
- R/Es: A799s + Reseats + 2A3s alignments = 69.4 % of IMAs.
- RDPs: A799s + Reseats = 51.2% of IMAs.
- PSUs: A799s + Reseats = 71 % of IMAs.
- CPSs: A799s + Reseats = 55.4 % of IMAs.



— OUTSTANDING — AWM — AWP — BACKLOG



CASS Station Availability

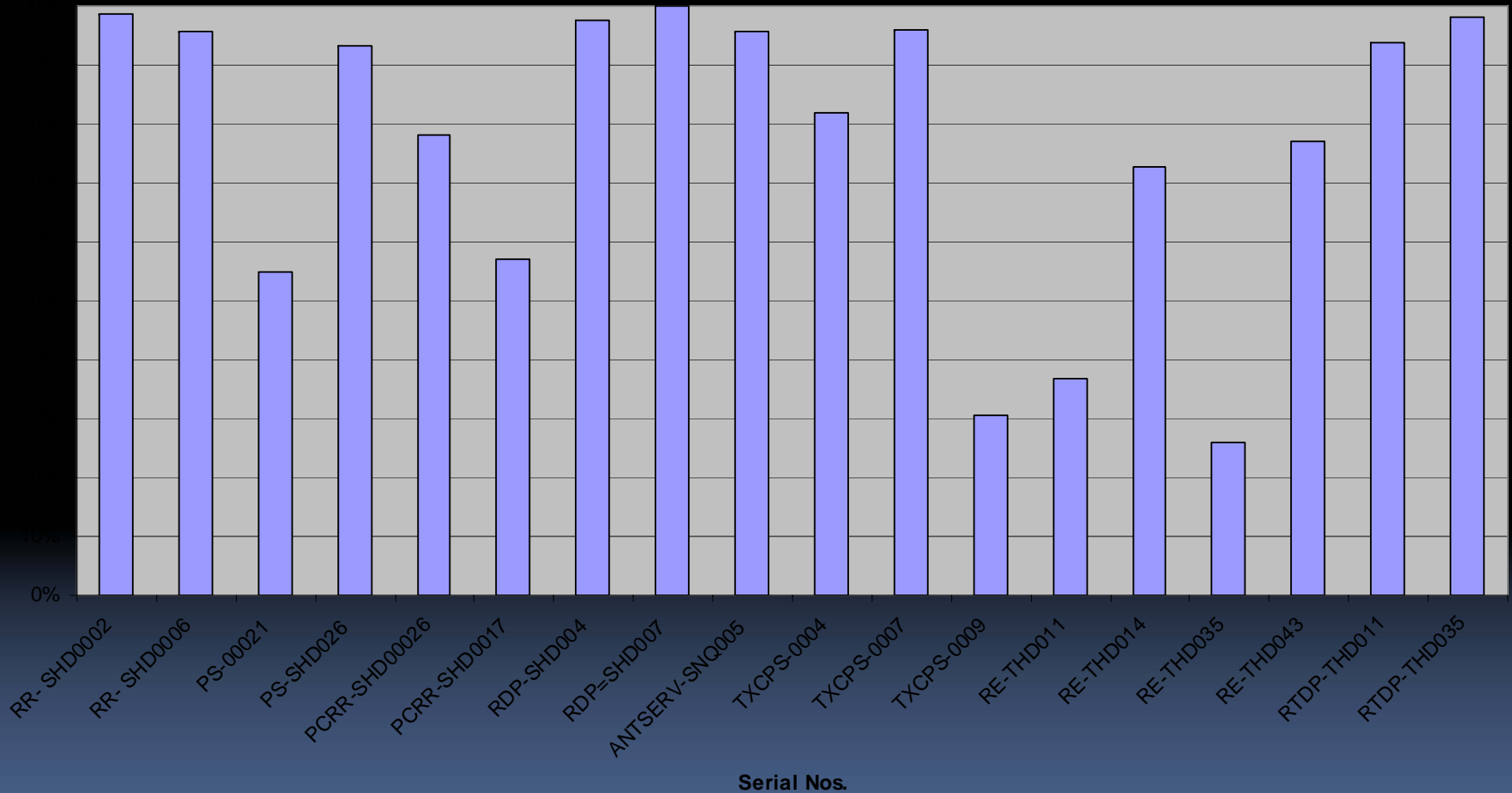


Station Availability is Stable expect one additional Station installed end of this month.

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TPS Availability



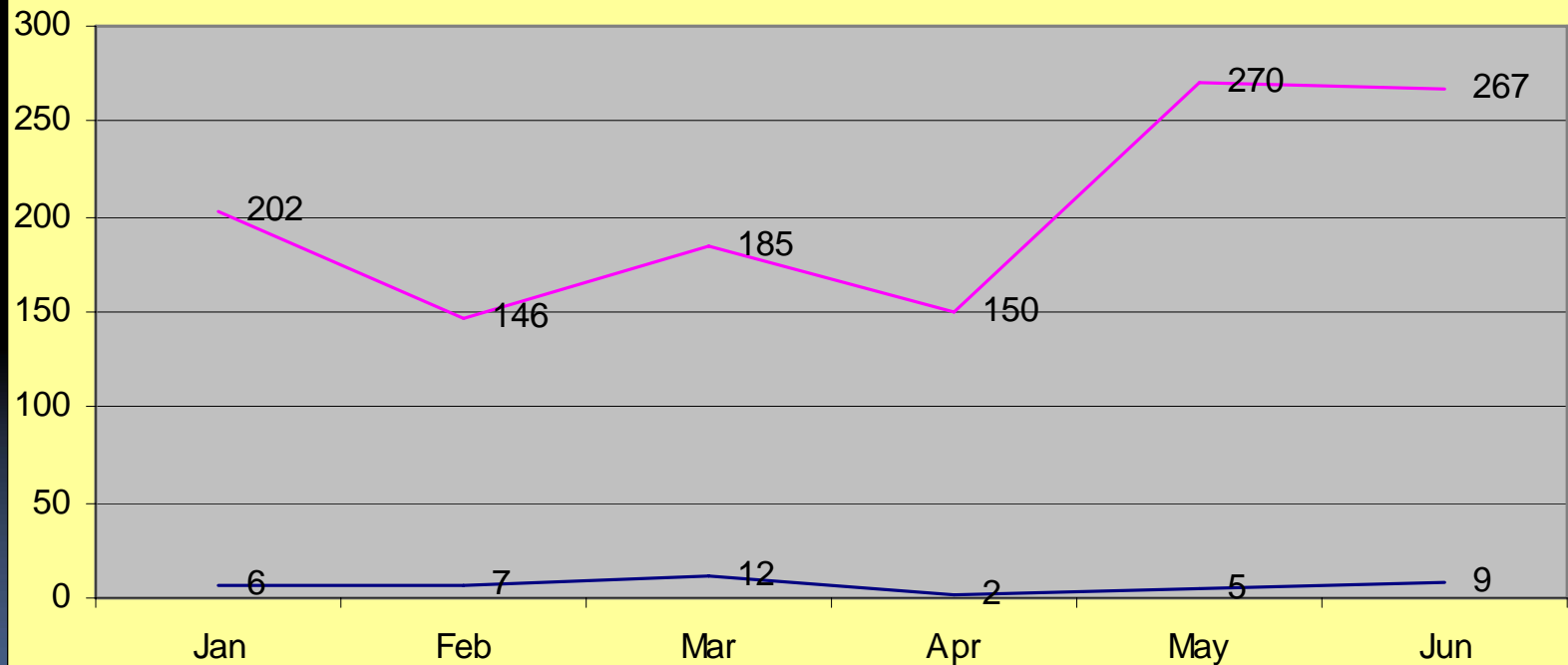
Additional RE ID has been received
and put into use.
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“Y” Codes Minimal



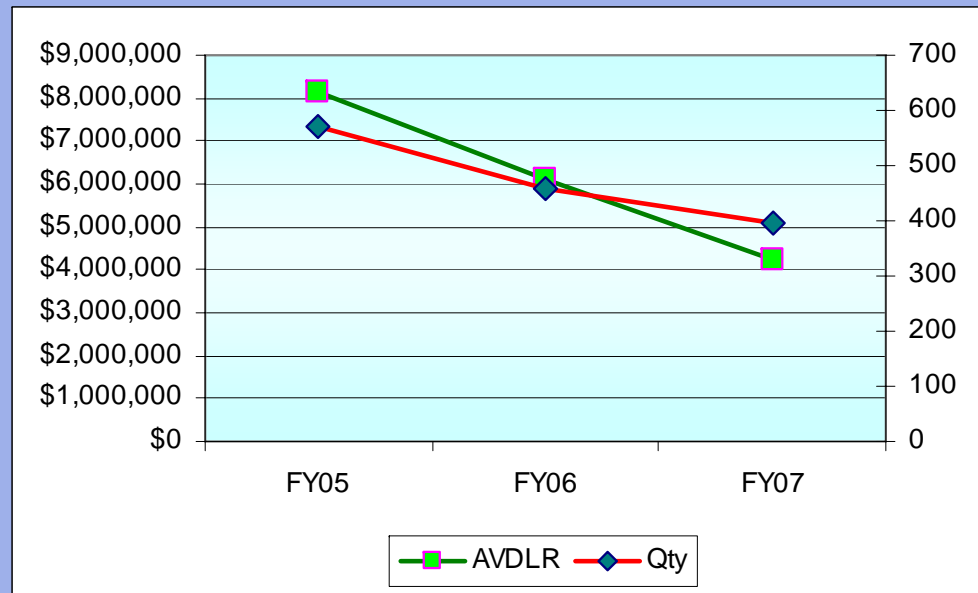
Lemoore 63E 'Y' Code vs Inducts - 2007



BCM COST SAVINGS

BCM Cost Summary

- FY07 AVDLR prices used in calculations
- Does not include R&R Support to other Sites

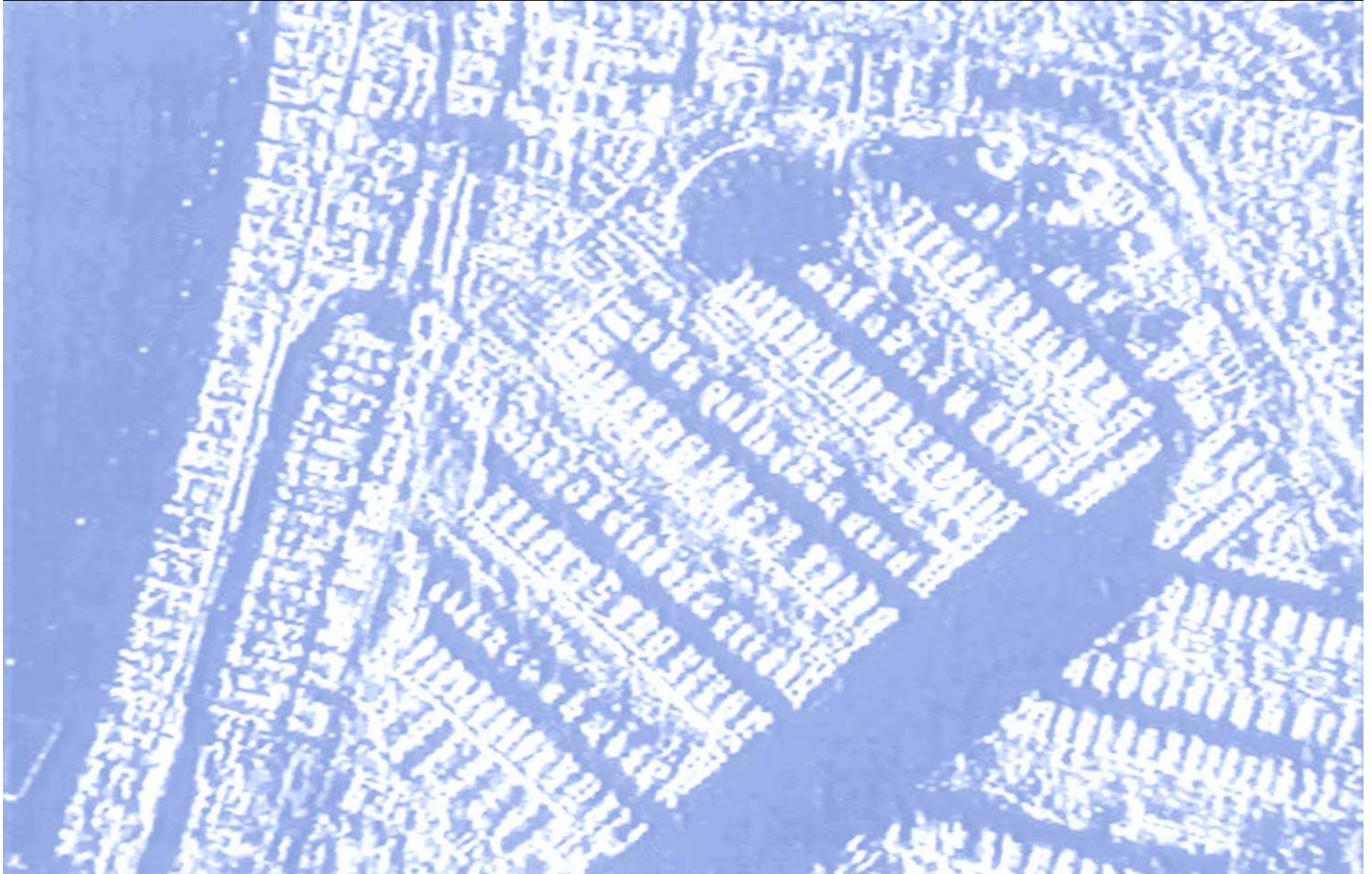


	What	Qty	AVDLR	MHRS	
FY05	WRA	101	\$3,570,179	5,695	
	SRA	471	\$4,598,637	2,525	\$8,168,816
FY06	WRA	56	\$2,189,037	1,833	
	SRA	404	\$3,936,383	2,866	\$6,125,420
FY07	WRA	14	\$586,879	301	
	SRA	383	\$3,627,909	160	\$4,214,788

Data Source: DECKPLATE

BAD ACTORS PROGRAM

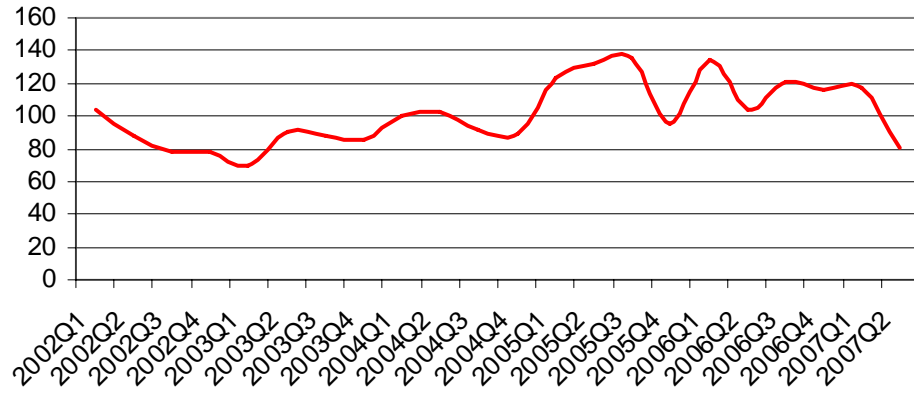
Bad Actors = Bad Eyes



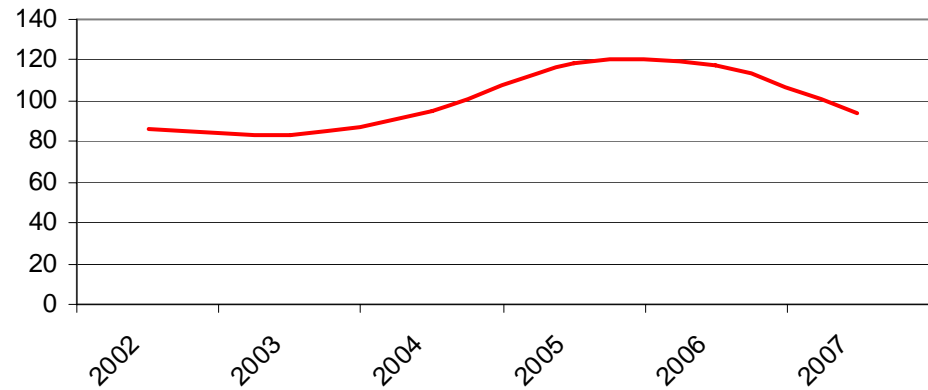
EXAMPLE OF LEMOORE XMTR DATA ANALYSIS AND RESULTING OPPORTUNITY

Similar Analysis has been
performed on all other major
Radar WRA's.

XMTR TOW FYQTR



XMTR TOW FY



***FY-07 QTR2**

XMTR BAD ACTORS

SERNO	RFC
TNW376	25
TFG110	23
TNW248	23
TFG081	21
MQJ618	21
PDR858	21
PDR979	21
REU465	20
PDR870	17
REU534	17
TFG026	16
PDR894	16
REU502	15
TNW409	15
MQJ552	15
PDR964	15
PDR012	15
TFG042	15
RTP667	14
REU522	14
TFG091	14
QGR246	14
REU473	13
TNW463	13
TFG097	13
TNW440	13
PUV218	13
TNW184	13
SAZ703	13
QGR316	13
QGR317	12
MCN000	12
TNW513	12

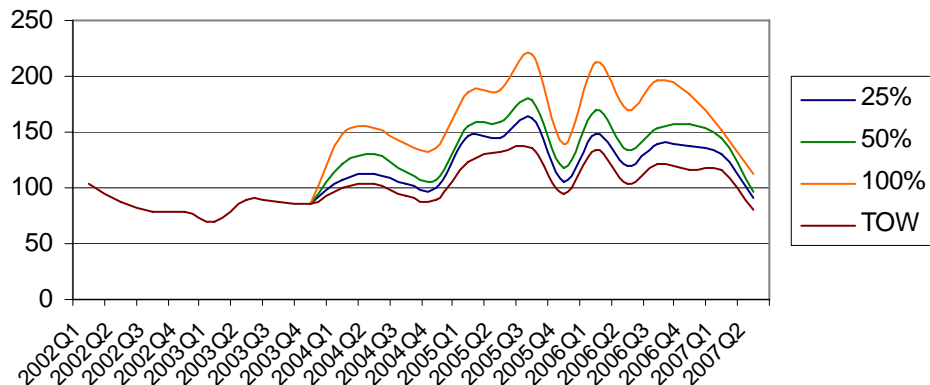
Only Top XMTR Bad Actor Serial Numbers are indicated in this slide.

Bad Actors = 11.3% of total XMTR S/Ns processed, 33.7% of XMTR O-Level Removals for Cause.

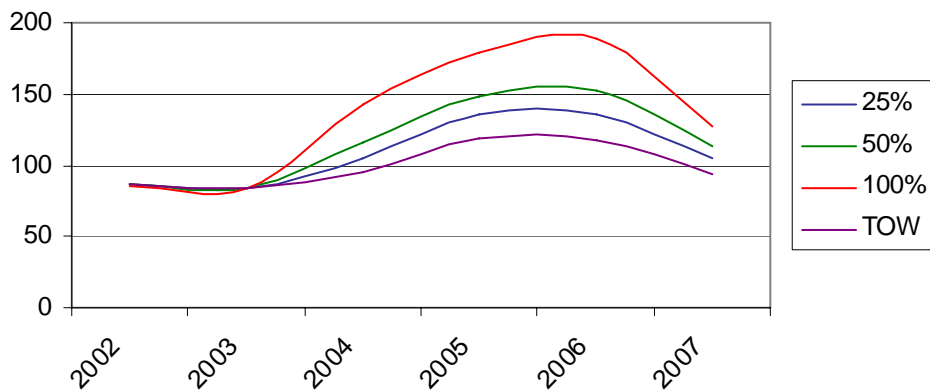
MA Mean	4.486667				
MA Median	3				
Std Deviation	4.111934				
Bad Ac tors	#MA > Mean +1 Std Deviation	8.598601			
Poor Performers	Mean + Std >= MA > Mean	Between 9 AND 5			
R Population	MA <= Mean	<=5			
Group	#S/N	%S/N	#MA	%MA	
Bad Ac tors	68	11.3%	907	33.7%	greater than 9
Poor Performers	122	20.3%	870	32.3%	6 to 9
R Population	410	68.3%	915	34.0%	5 and below
Total	600	100%	2692	100%	

XMTR O-Level Removals for Cause FY2004 to 2007-QTR2

XMTR TOW Bad Actor Populations



XMTR TOW Bad Actor Populations



XMTR Bad Actor S/N were removed from Time on Wing calculations based on top 25% of XMTR Bad Actor population and at the 50% and 100% populations from FY2004-FY2007 QTR2. FY2002-FY2003 was used for baseline comparison of trend.

Wanted Posters

SERNO	Total
TNW376	25
TFG110	23
TNW248	23
TFG081	21
MQJ618	21
PDR858	21
PDR979	21
REU465	20
PDR870	17
REU534	17
TFG026	16
PDR894	16
REU502	15
TNW409	15
MQJ552	15
PDR964	15
PDR012	15

RFCs removed at 25%

SERNO	Total
TFG042	15
RTP667	14
REU522	14
TFG091	14
QGR246	14
REU473	13
TNW463	13
TFG097	13
TNW440	13
PUV218	13
TNW184	13
SAZ703	13
QGR316	13
QGR317	12
MCN000	12
TNW513	12
MQJ353	12

Additional RFCs removed at 50%

Additional RFCs removed at 100%

SERNO	Total
PDR049	12
QGR286	12
TNW326	12
TCH966	12
MQJ560	12
QXC355	12
REU510	12
SAZ738	12
MQJ507	11
TNW486	11
TNW438	11
TFG119	11
TNW163	11
TFG165	11
TNW276	11
TNW262	11
TNW197	11
QGR338	11
MCN284	11
PDR929	11
PDR941	10
QGR307	10
QGR342	10
QXC402	10
TNW414	10
TFG070	10
PDR972	10
QXC422	10
TCH977	10
PDR039	10
TFG089	10
MQJ502	10
PDR961	10
MQJ398	10

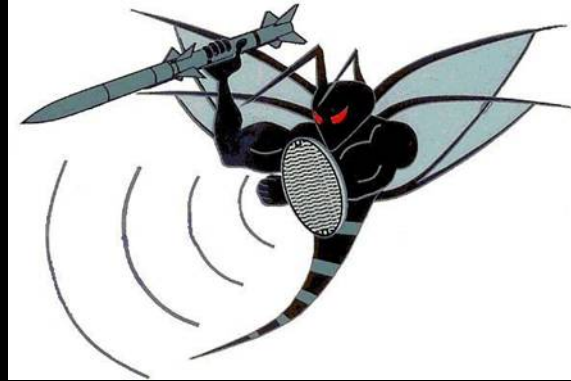


Bad Actor Process

- Root Cause Analysis
- Thermal Cycling
- SPUR Testing
- Hard line & Waveguide Testing
- Filter Testing
- Nominal Alignment
- Critical Timing/Temporal Testing
- Simulated Flight & Comparison to CASS

Tx MQJ-618 example

- Number one Bad Actor transmitter in the fleet FY05-FY07
 - 24 Failures in two years
 - Reworked by FRC May 07
- Stayed in aircraft 11 months before failure
 - >260 transmit hours
 - Previous 5 maint. actions had a total of 11 operating hours



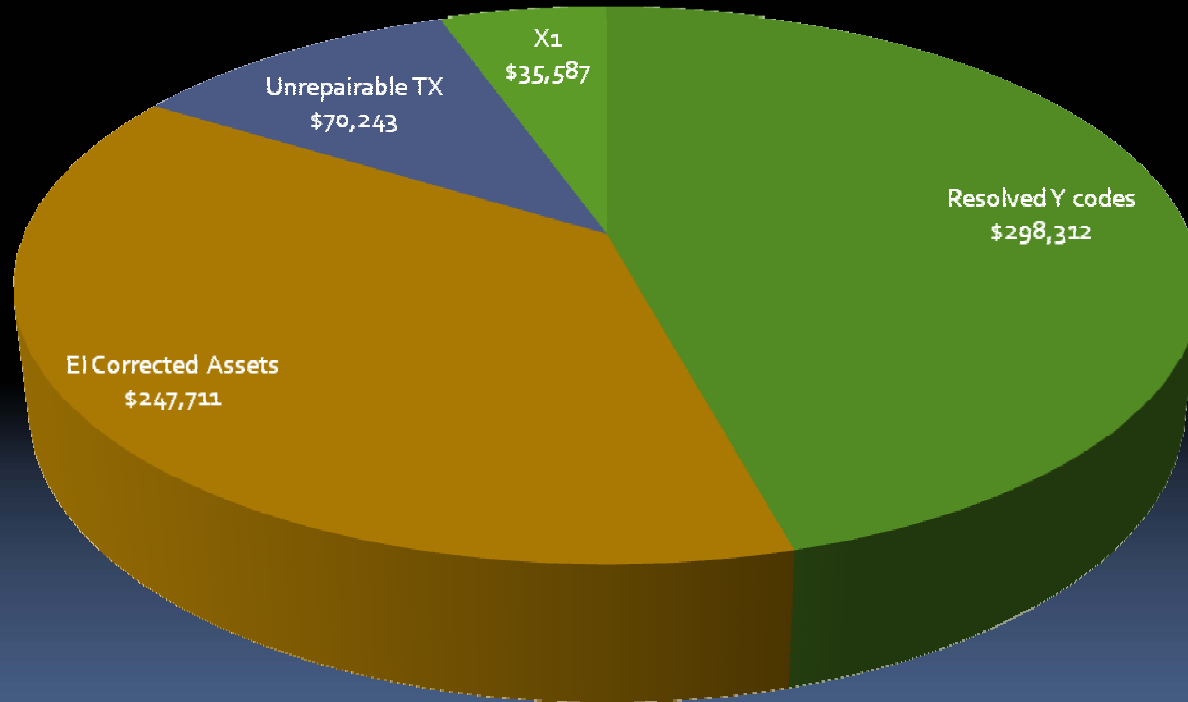
INTEGRATED TEST BENCH (ITB)
BENEFITS
FRC WEST LEMOORE

ITB Uses

- Y-coded WRA's (Repeat offenders for same fails).
- CASS TPS not available but supported by ITB.
- Data/Arithmetic problems undetected by CASS simulation.
- Bad Actor processing.
- CASS improvement through ITB test validation.

Integrated Test Bench Statistics: Total Cost Savings from 12/5/08.

Total ITB Benefits \$651,853



FRC Mid Atlantic Critical EI

- EI Investigation
 - 1 yr from fleet intro of Spur Corrections (FST Lead Time). FRC East will be eliminating spurs from their RRs while in repair cycle.
 - RADAR Receiver Spur Root Cause Analysis (Troy Gordish). Local Oscillator failure mechanism.

Quantity to Quality based maintenance and benefits

TOW SAVINGS

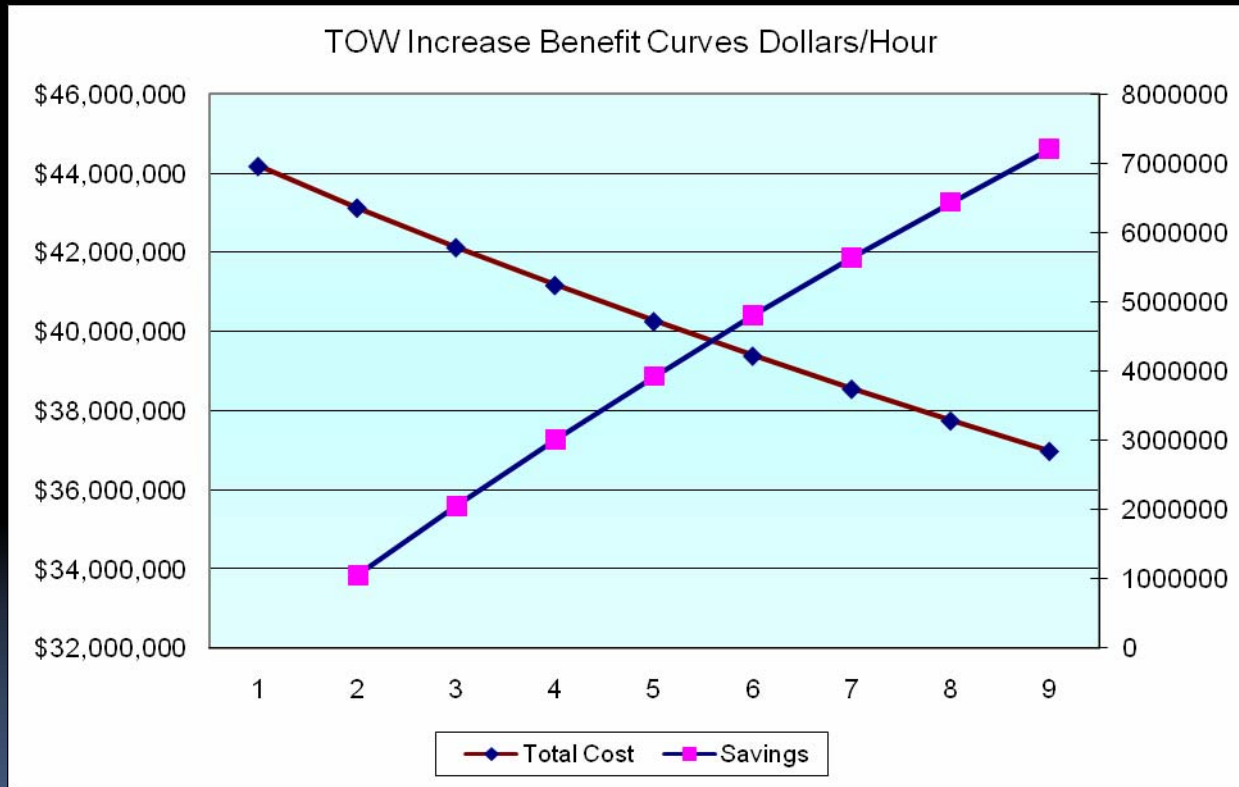
TOW Benefit

- TOW Cost = Total Cost of Repair = \$44M
- TOW Increase = Reduction in Repairs
- Example = 100% Increase in TOW = 50%
Reduction in annual cost of repair = \$22M.

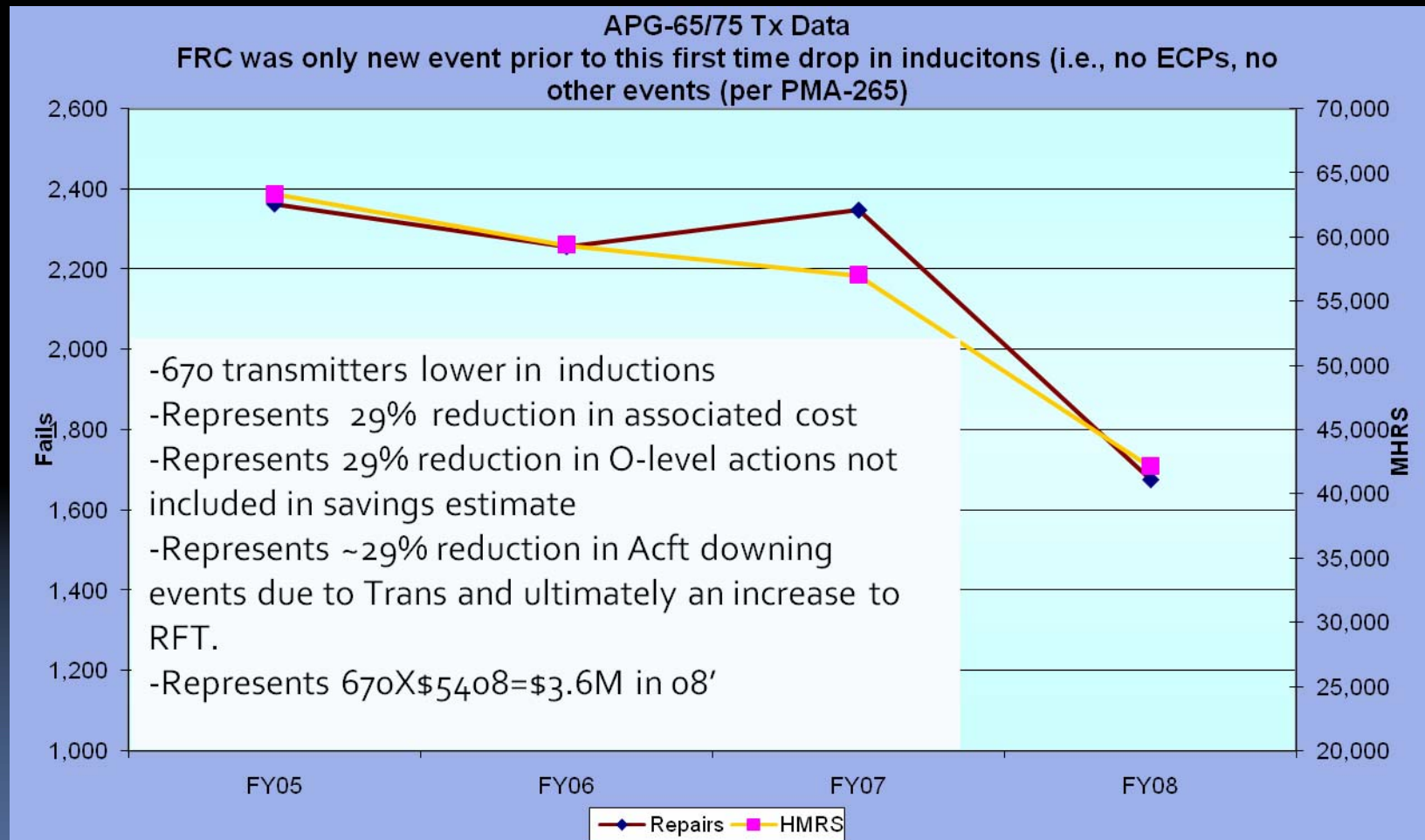
TOW Benefit

- Can maintenance practices change TOW
- Yes COE supported systems are running approx 20% higher TOW than rest of Fleet which yields approximately \$2M/year savings
- COE supported systems are costing the fleet less from BCM interdiction savings and reduced cost based on higher TOW
- Y code removals, Bad Actor Program etc.

FRC TOW Increase Benefit about \$1M/Hr



FLEET Wide Transmitter Impact



Changing the Deployed Fleet Cost

- Can the COE and ARAT efforts change the cost of afloat Fleet Repair
- Yes, thru local EI driven SW changes which improve Fleet Repair Capabilities



Fleet fiscal impact from TPS changes

- 31 TPS Changes in integration, release process or fielded
- Antenna: PCOF corrected from Right Torque Motor to Sum Motor.
- R/E RF aligns 2A2, 2A3, 2A4, 2A5, 2A7
- RDP Video
- R/R 2A5 TN 2422, 2440: Correct call out from U113, U114 (not in ckt.) to U112
- CPS 7A2: Corrected PCOF of -15V circuit from U101 (not in ckt.) to U105

APPROACHES & Actions Taken

- Incorporated Innovation Cell Findings
- Baselined TOW & Cost
- TOW Baseline
 - TOW completed
 - MTBD Lemoore Card Deck
 - Bad Actor Determination (By SN)
 - TOW
 - A799 (CND)

APPROACHES & Immediate Actions for Effect

- **Bad Actor Elimination**

- Remove small percentage for initial significant reduction
- FRACAS (i.e., perform Root Cause Analysis)
- **Change SM&R Codes/ICRL**
 - Example Transmitter Auto BCM for Transmitter Chassis & 1A2 PSs
- **Instill process for History Cards**
 - **NAMP Change for ETI on MAFs (LT Penrod)**
- **Scrap Rate**
 - Investigate Scrap Rate from ARF
 - Hard Line Manufacturing (FRC)
 - Micro Min instructions and training
 - Potted Chip Removal & Card Trace Repair

APPROACHES & Immediate Actions for Effect

- **Training**
 - Teach SMEs how to read CASS digital code
 - Recommendation, CWO₃ Daniels approach for troubleshooting publications
 - PMA-265 Training Initiatives
- **CND Reductions**
 - Supplier CNDs under investigation (Tom Henderson, Kevin Odel)
- **A799 Reductions**
 - Feedback to O-level
 - Feedback to SRA Repair
 - BOA ECT evaluation

APPROACHES & Actions Moderate Term

- **Cooperative FRACAS**
- **ADSR/Smart TPS**
- **Process Flow Modifications**
 - **Primary Highway**
 - **Rework Lane**
 - **Feedback Loop for Improvement**

The Way Its Supposed to Be



RESULTS

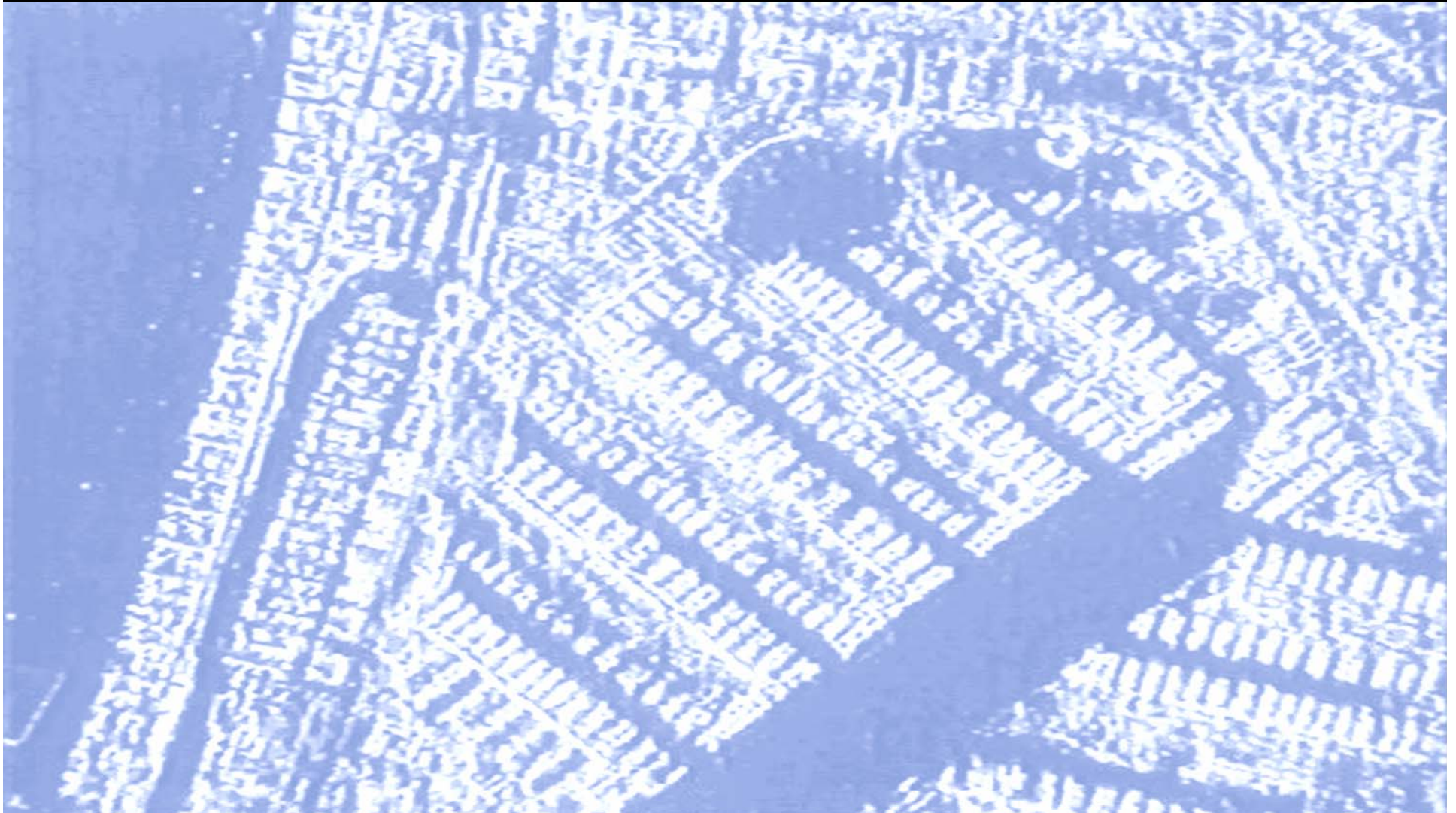
Results:

- RE/RR/XMTR/ANT TOWs(MTBDs) have increased and FY08 levels are currently being calculated by FST. Expectations were in the range of 2-3 hrs/Radar = \$2-3M FY09 targets another 4 hrs/radar=\$8M *
- Cost Reductions in AVDLR from BCMI to date > \$14M
- Radar COE is transitioning from Quantity Driven Repair to Quality Driven Repair Meeting Demand
- The approach utilized for Radar Transformation is now being utilized for other commodities.

*calculations based on 2007 NAVICP AVDLR Costs



The Way It Was





The Way Its Supposed to Be





ARAT Initiatives

- Transitioning ATFLIR to COE Template
 - BCMI candidates at FRC SE, W & MA
 - Introduction of TOW Initiatives
- F-18, P-3, E-2, H-60 Initiatives (as well as GCUs)
- F-35 DSORs Read Team Technical Preparation and Proposal Preparation
- F-35 RADAR Selection and Stand-Up



Bottom Line



COMFRC Avionics Rapid Action Team is:

- *Driving Increases In TOW (direct impact to RFT)**
- *Reducing the Cost of Maintenance beyond BCMI**

**Transitioning from Quantity Driven
Repair to Quality Driven Repair
Meeting Demand**

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How does that affect you?

- FRC is looking at new technologies
 - Navy PMA-260's approach to Diag. Health Data Management (as well as others, ALIS, ADSR, etc.)
 - Army's approach to DSETS/V₃ TPS rehost
 - AF's SME connectivity to Prime Weapon Systems
 - High Density Testing
 - Temporal Testing & Thermal Cycling
 - New Tester Design Innovations & Instruments
 - EW, EO, ECM, ECCM, Gen's, Antenna Arrays, SRA's
 - Props, Composites, Pneumatics, Hydraulics, etc.