



412th Test Wing



War-Winning Capabilities ... On Time, On Cost



Controlling Work-In-Process: Multi-Project Scheduling

U.S. AIR FORCE

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Approved for public release; distribution is unlimited.
412TW-PA-19246

Integrity - Service - Excellence



Overview



- T&E Project Management
 - The Time – Workload – Capacity Dilemma
 - The COAs
 - WIP management Take-Aways
 - Project schedule planning in Concerto web
-



Definitions



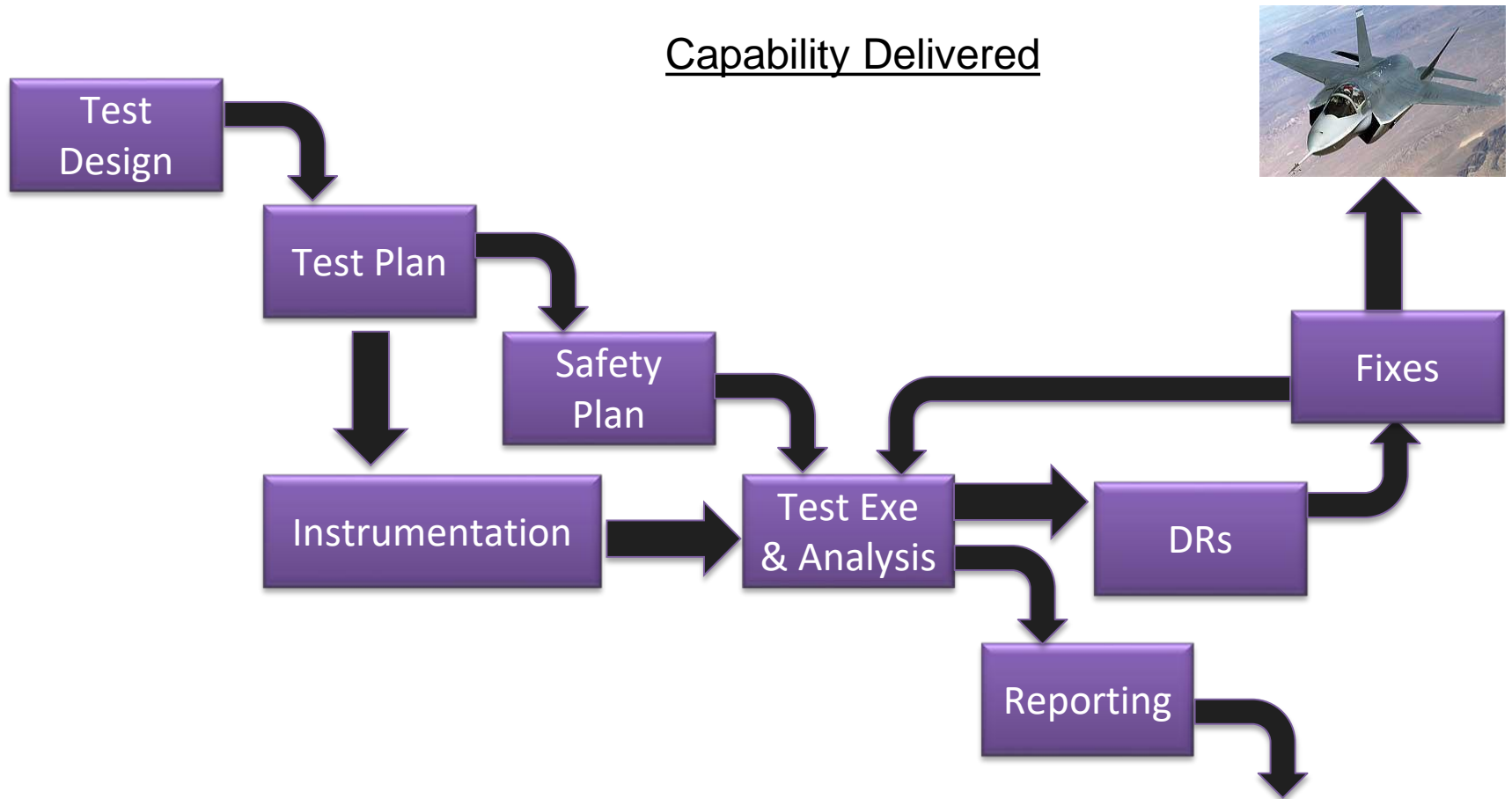
- WIP: Work In Process. Work already in progress or ready to start.
- High-WIP: WIP that remains above organizational capacity for extended period of time. Too much work.
- Low-WIP: WIP at or below organizational capacity.
- Multi-project environment or portfolio: Multiple projects within the same windows of time using common resources.
- CCPM: Critical Chain Project Management. A scheduling method that drives a multi-project environment to Low-WIP.
- Synchronization: a portfolio level decision process for orchestrating organizational resources and project timing to maintain low-WIP.



T&E Project Management



What are we managing?



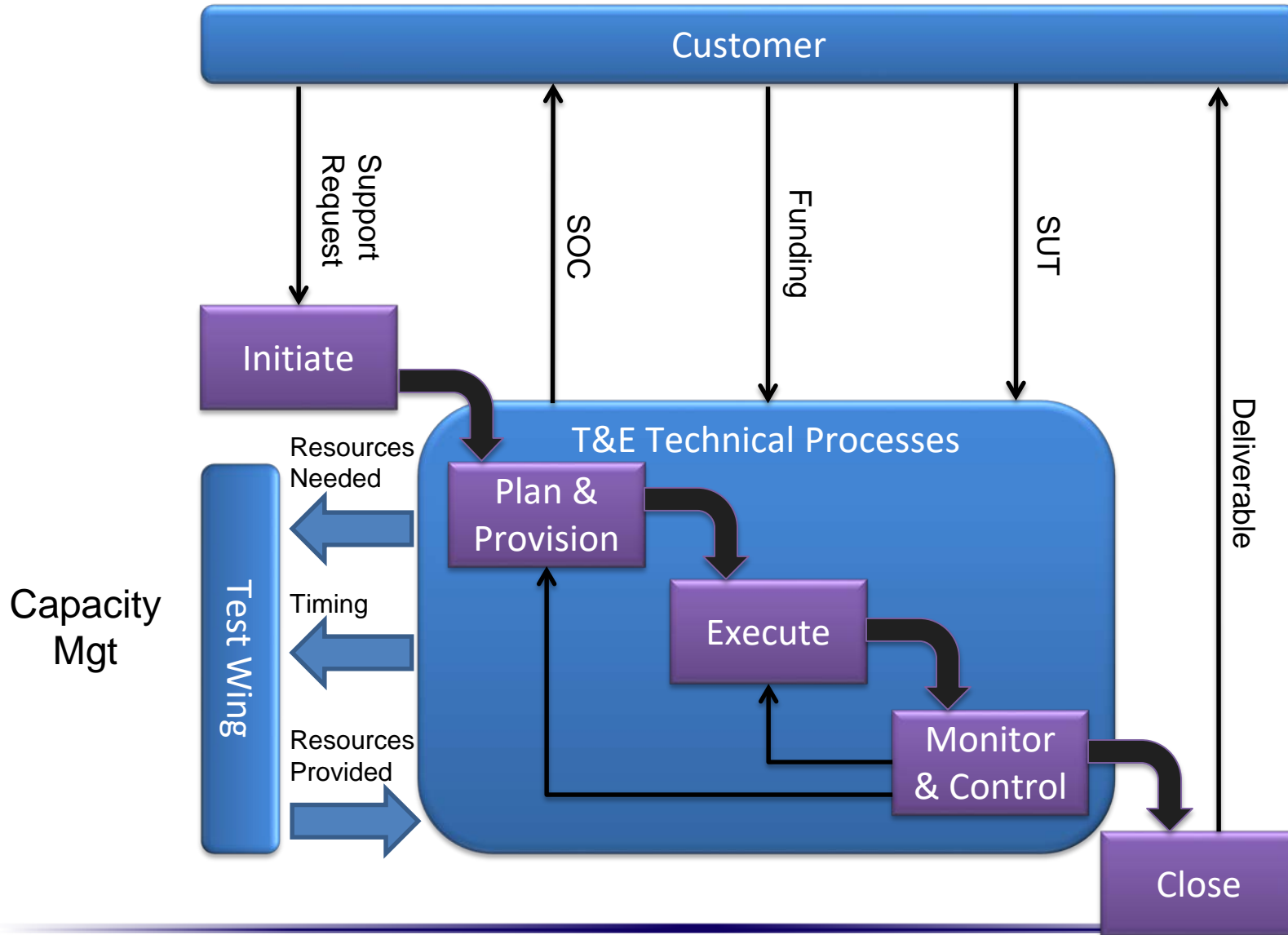
Capability Evaluated

- Acquisition Milestones
- Fielding Decisions
- OT Certification
- Advanced HW buys

T&E Technical Processes

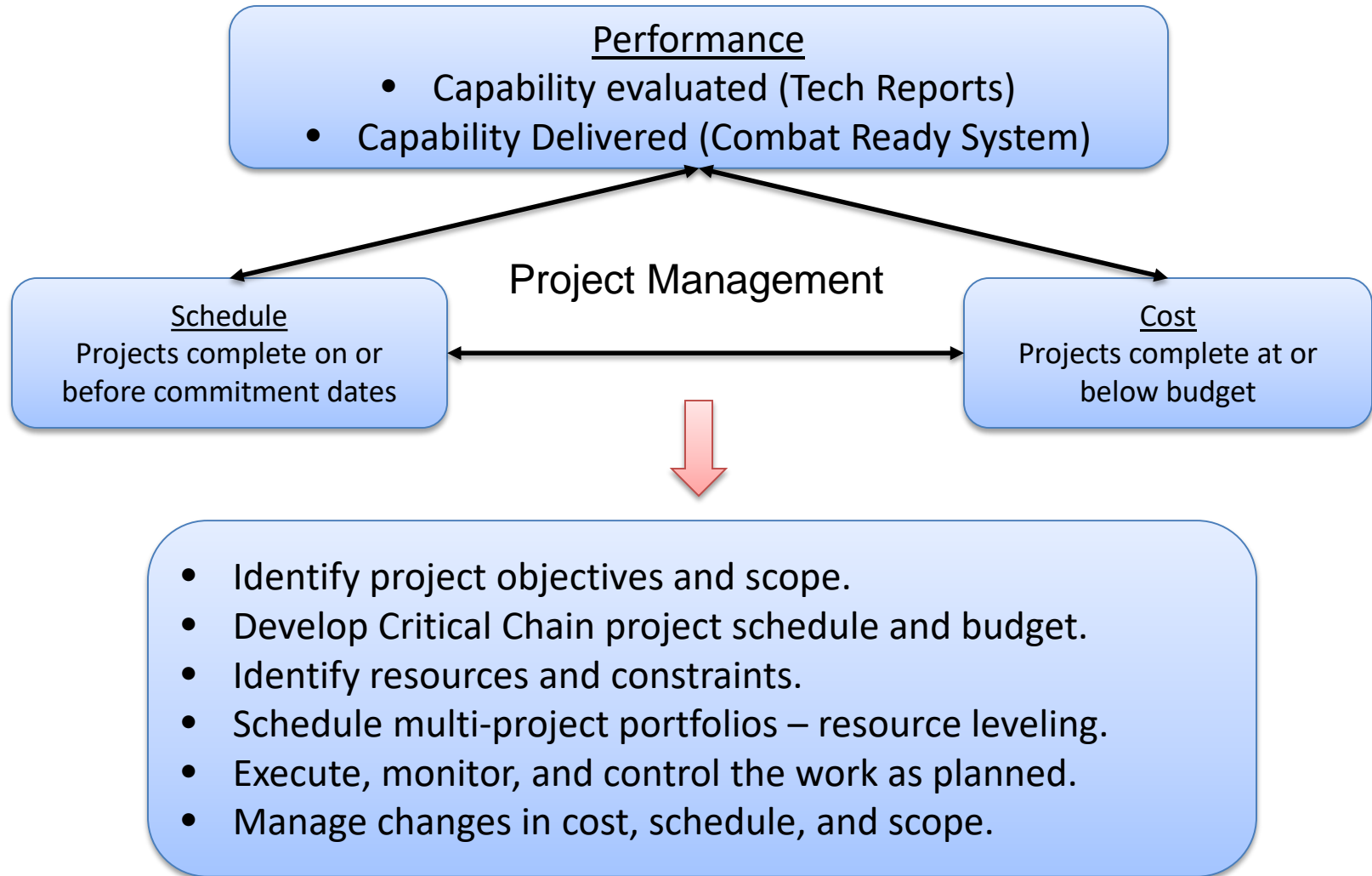


Project Management Process





Project Management Methods





Project Planning Process



Work Scope

Schedule – Cost – Resources

SOC

Customer Req'ts

- Analysis of req'ts
- Test Design
- Project scope

Work Scope

- Project schedules
- Assets; resources
- Cost Estimate

Project Plan

Statement of Capability (SOC)

SCHEDULES

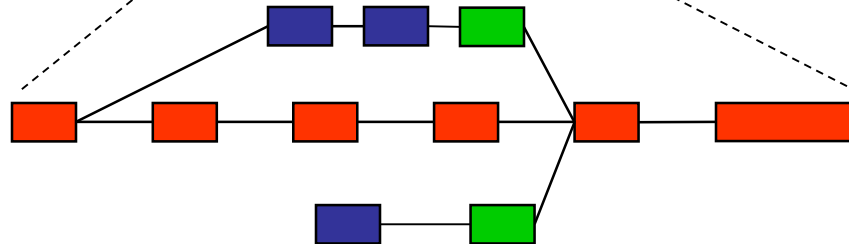
Test & Safety Plan

Instrumentation

Flight Test & Analysis

Reporting

- TASKS
- DEPENDENCIES
- RESOURCES

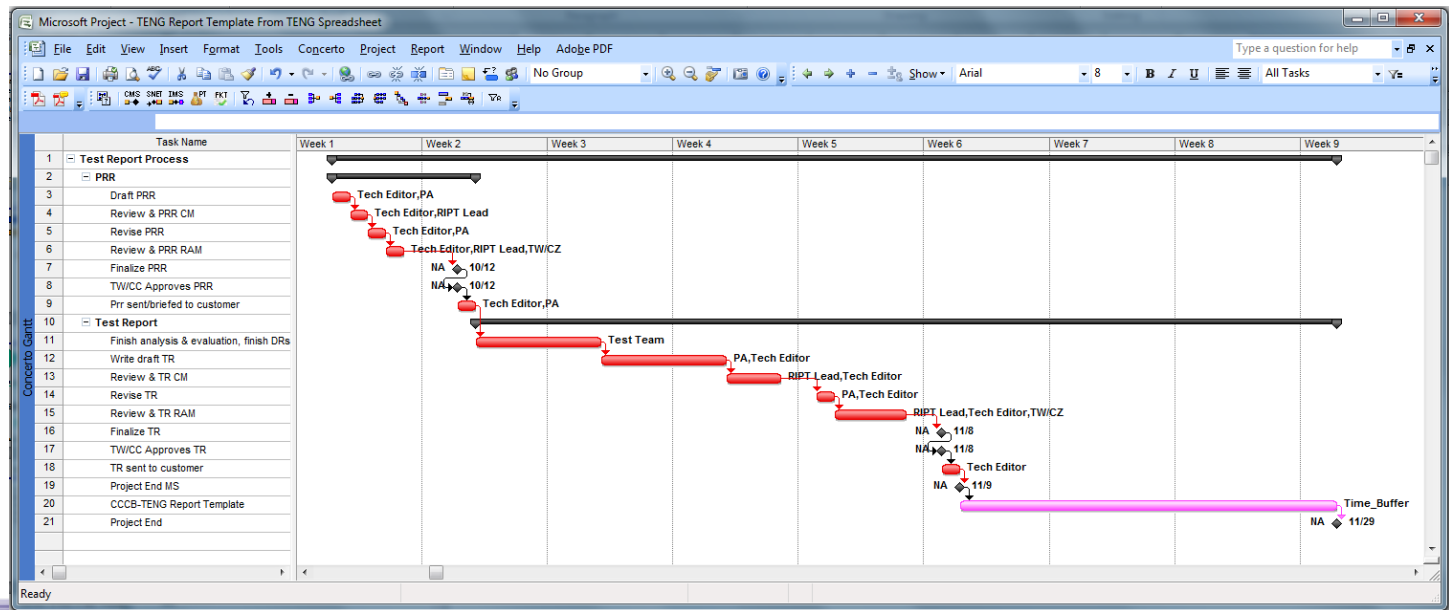




Standard Project Templates



- Statement Of Capability (SOC)
- Test Plan
- Safety Plan
- Flight Test & Analysis
- Reporting

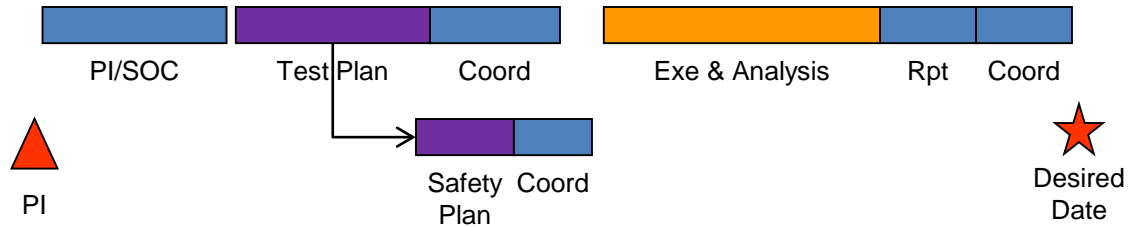




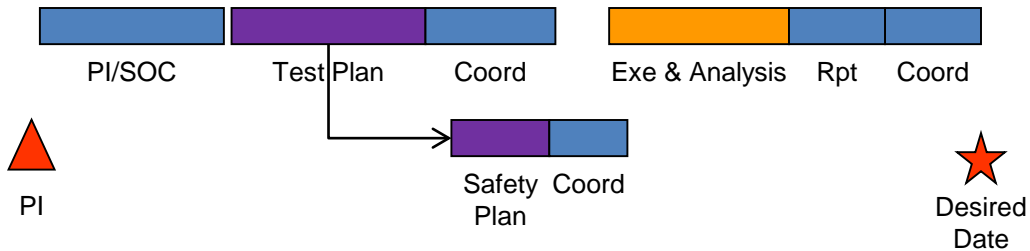
Multi-Project Portfolio



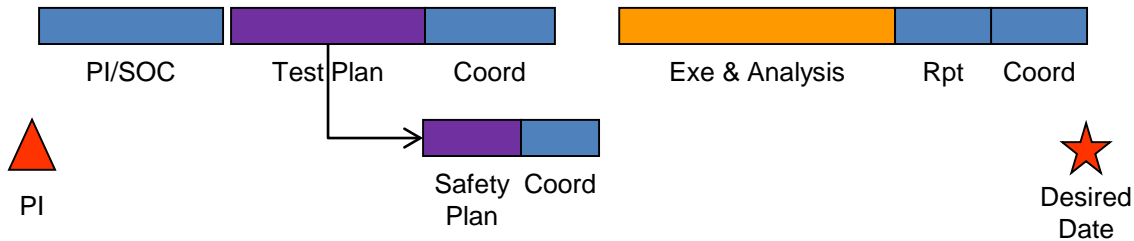
Project 1



Project 2



Project 3





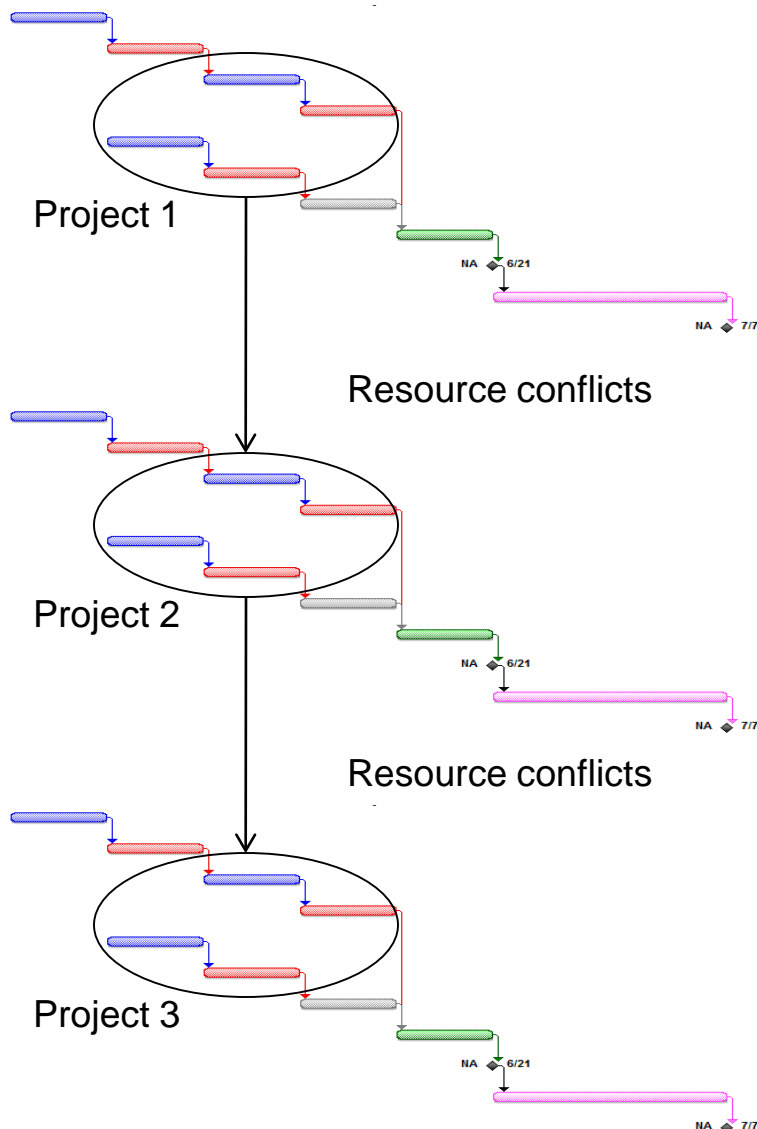
The Time – Workload – Capacity Dilemma



How High WIP Happens



412TW



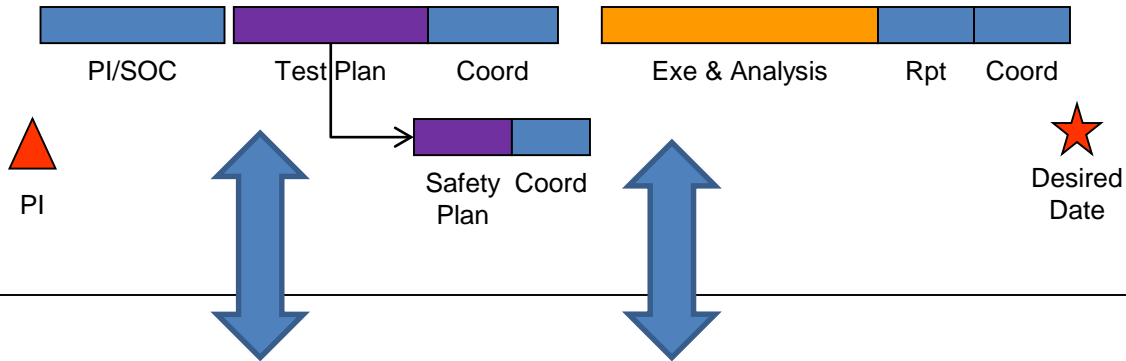
- Projects are scheduled to begin ASAP because the organization wants to appear responsive to the warfighter needs
- Due dates are imposed on the organization
- Customer pressure to start work
- Projects are planned in isolation by different project teams, each assuming they will get resources when needed
- Projects are planned without considering organizational resource capacity



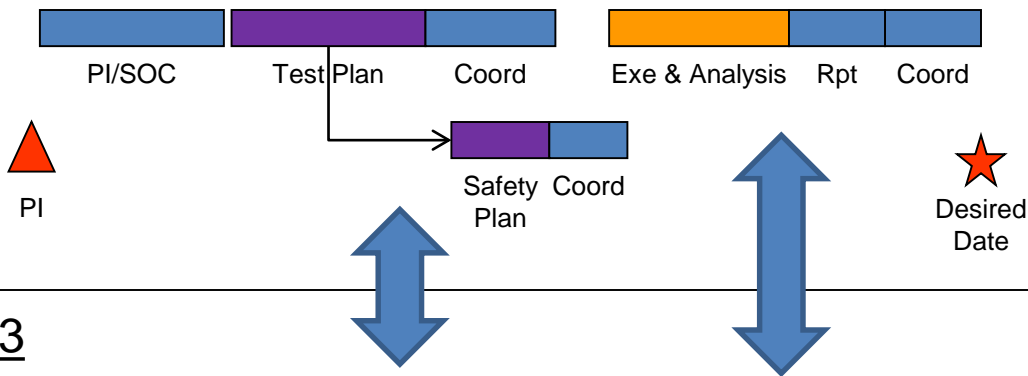
Multi-Project Portfolio



Project 1



Project 2



Project 3





A Scenario



- Situation:
 - You are a senior leader of a successful organization that is facing a large upswing in workload.
 - You are concerned the workload will remain above your organizational labor and asset capacity for several years.
 - What is your strategy to handle the increased workload?



The Dilemma



- If it is anticipated the organization will remain high L:C for an extended period of time then do we:
 1. Accept all work as is. Expect the workforce to do whatever it takes to deliver, regardless of the demands placed on them.
 2. Add capacity to the organization to handle anticipated workload.
 3. Rebalance existing capacity using pockets of available capacity to resolve pockets of excessive workload.
 4. Synchronize projects: Schedule portfolios to maintain workload within capacity.



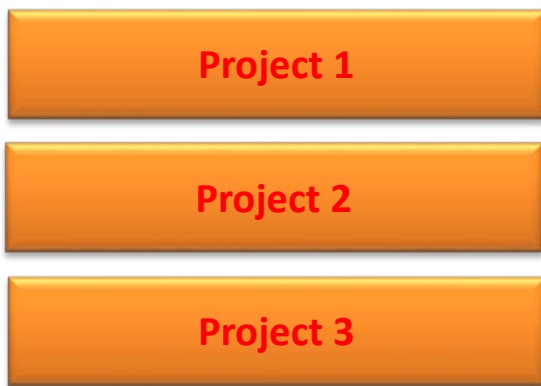
The COAs



COA-1: Accept all work as is High L:C (high WIP)



- A simple example: can we deliver on time if we are high WIP?



- 3 tasks ready-to-start at the same time
- Only one engineer - required for each task
- 3 project managers

▲ - Each task needs to finish on time to ensure the projects finish on-time!

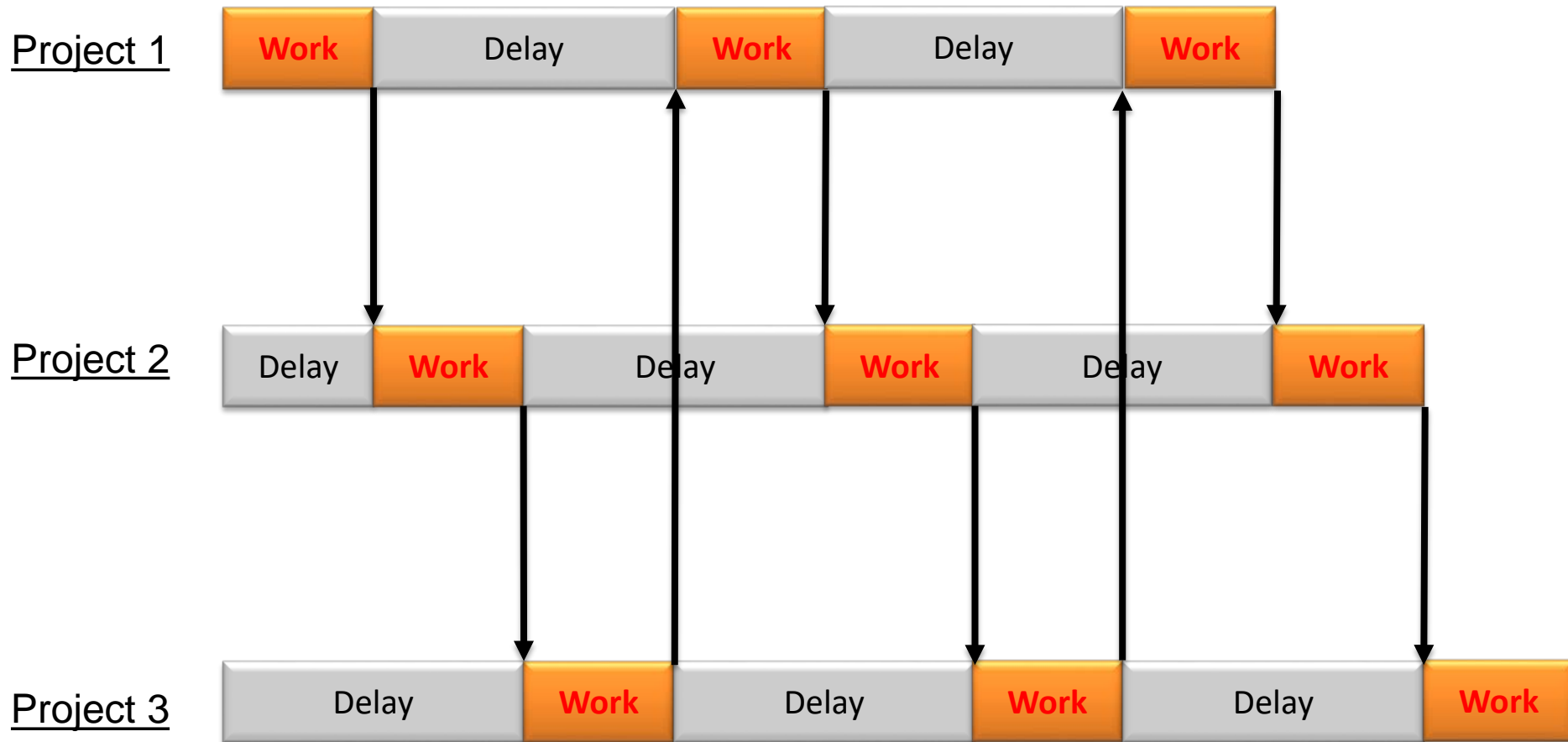
Looks great on paper!



COA – 1: High WIP Execution



- The reality: Much more delay than productive work!





COA – 1: High WIP Result



- 2.7 x longer to complete the work (just due to wait time)
- What happens to cost?



High WIP: The Inevitable Results



- Far more unproductive delay than productive work
- Delay increases with number of overscheduled tasks
- The effects of delay are cumulative
- Projects can't deliver to their commitments
- Absent using other approaches to schedule work, the organization is compelled to continue seeking additional capacity it may never receive
 - COA - 2



Low WIP is Better



- Eliminates a root cause for major project delay
 - Resources are not over scheduled
- Improves Results
 - Projects reliably deliver on-time and on-cost
 - Capability promised is capability delivered
 - Projects get shorter and more cost effective
- Two options to go low-WIP
 - Resource domain – more capacity
 - Time domain – adjust workload timing to remain within current capacity



COA – 2: Increase Capacity



- A valid approach to address high WIP, however...
- Increase in organizational capacity is:
 - Difficult to sell: need a strong business case
 - Difficult to implement
 - Time consuming due to processes and lead times involved
 - Costly
 - Difficult to reduce if and when necessary:
 - Increasing capacity can result in a permanent solution to a temporary problem
 - No guarantee of success
- Difficult to match resource building to project timing
- In the current environment, this COA is very difficult



COA – 3: Rebalance Existing Capacity



- Apply existing resources when and where needed
 - Leverage the natural workload peaks and valleys across the organization
- Lead time issues
 - Security access requirements
 - Skills required or domain expertise
 - Spin-up time for transitioning to a new project and aircraft system
- Information needed is: what resources are needed, how many, when, and for how long
- Requires resource management processes
 - Insight into how workload is projected to change
 - Project status, timelines



COA – 4: Synchronize Workload



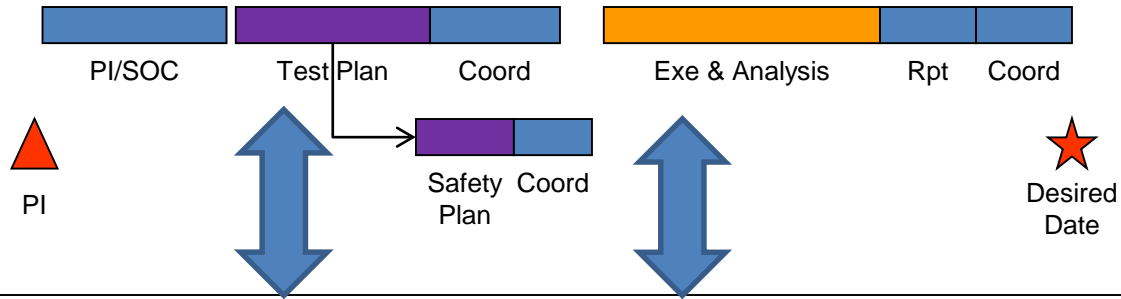
- Schedule project workload at or below capacity by shifting some projects to different timeframes
 - High priority projects are scheduled first
 - Some lower priority projects are shifted to reduce or eliminate sustained overloads
 - Negotiate with affected customers
 - Quantified details help customers understand impacts
 - Projects can still have areas of overlap, impacts are minimized, making negotiations easier



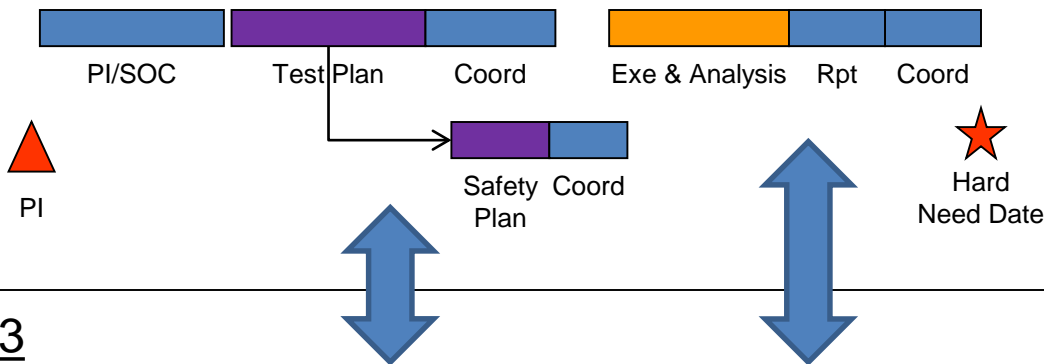
High WIP Portfolio



Project 1

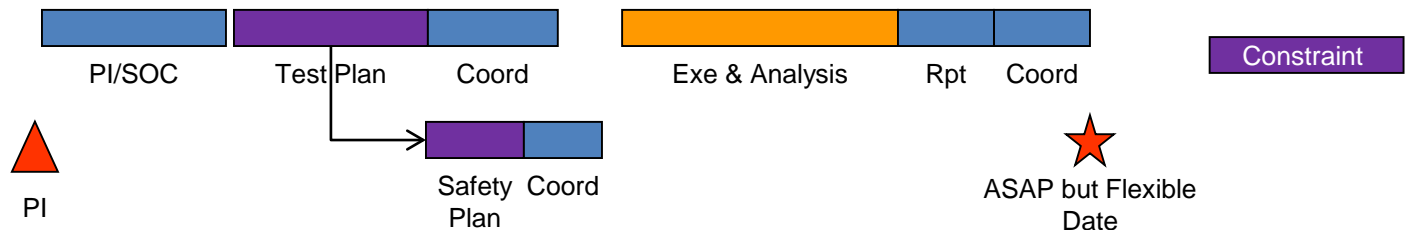


Project 2



- Resource contention
- Competing priorities
- Delays

Project 3

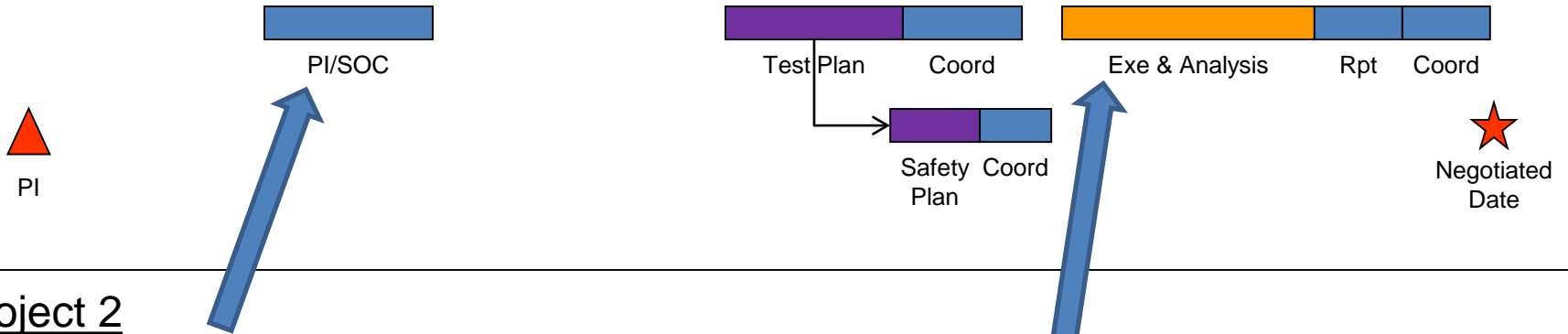




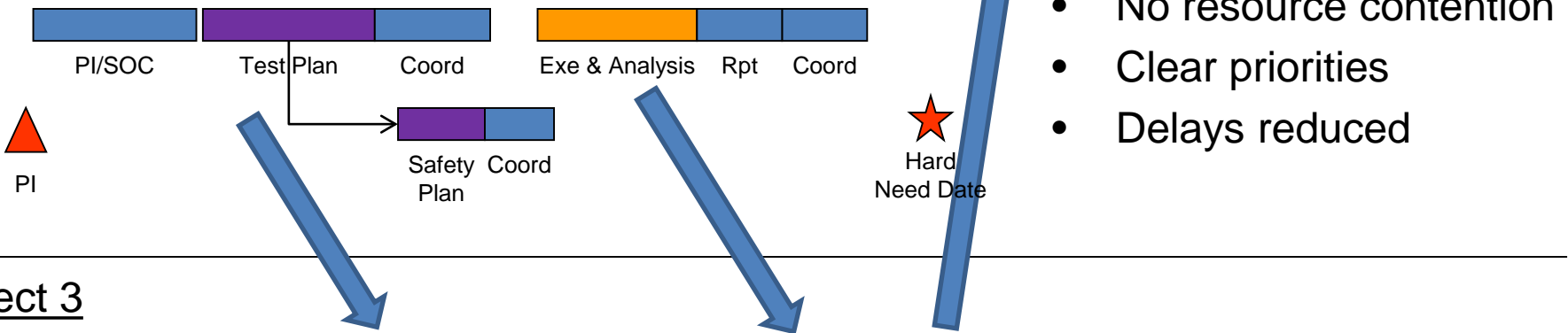
Low WIP Portfolio



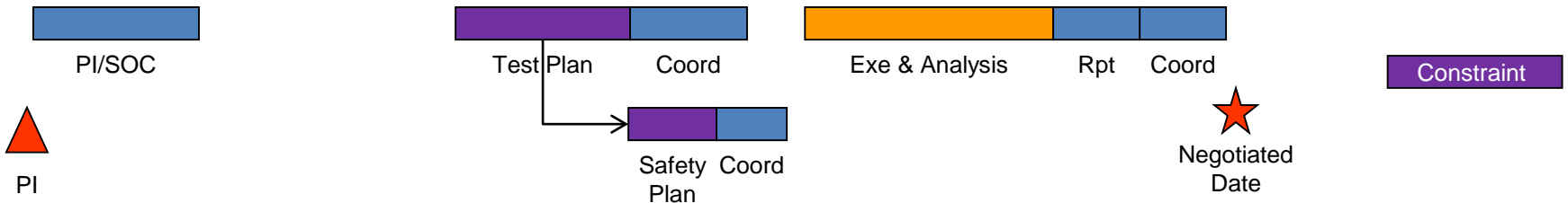
Project 1



Project 2



Project 3





COA – 1: High WIP Execution



Project 1



Project 2



Project 3

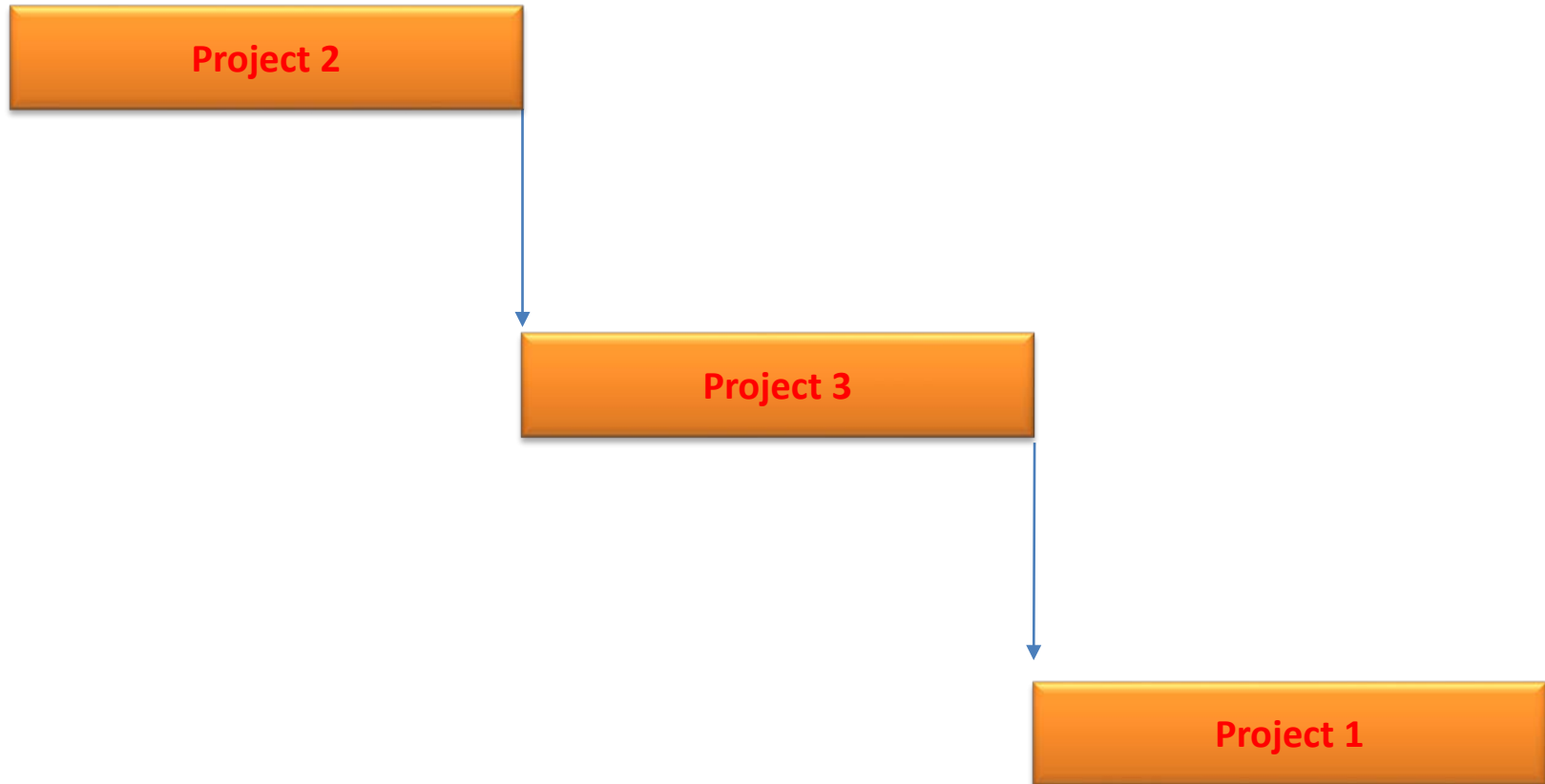




COA 4 - Low WIP Execution



- Clear priorities, reliable commitments, no overloaded workforce.





Resolving the Dilemma



- The forbidden COA: COA-1
- The Synchronization Decision Process (SDP)
 - Follow the WIP rule: resources will not be over scheduled for extended periods of time
 - Then apply COAs 2 – 4 in the correct order
 - COAs combine well together when performed in the correct sequence
- Sequence
 - Synchronize – Rebalance – Increase (4 – 3 – 2)
- Decision Process:
 - Fix high priority projects within required schedule slots
 - Load lower priority projects
 - Review L:C
 - Work with functionals on rebalancing resources where possible
 - If L:C issues still exist, decide which lower priority projects may need to shift to maintain low WIP. Quantify impacts; work with affected customers.
- If some projects are still non-negotiable and L:C problems persist, consider adding resource capacity – you will have a strong business case!



Take Aways



- We cannot remain high WIP and expect to do our part faster – it won't work
- We cannot remain high WIP and expect to retain our best, most experienced people
- We must rule WIP or WIP will rule us
- It is far easier to change project timing than it is to increase resource capacity
- We have the tools and methods to resolve many of our own resource capacity issues



Questions?

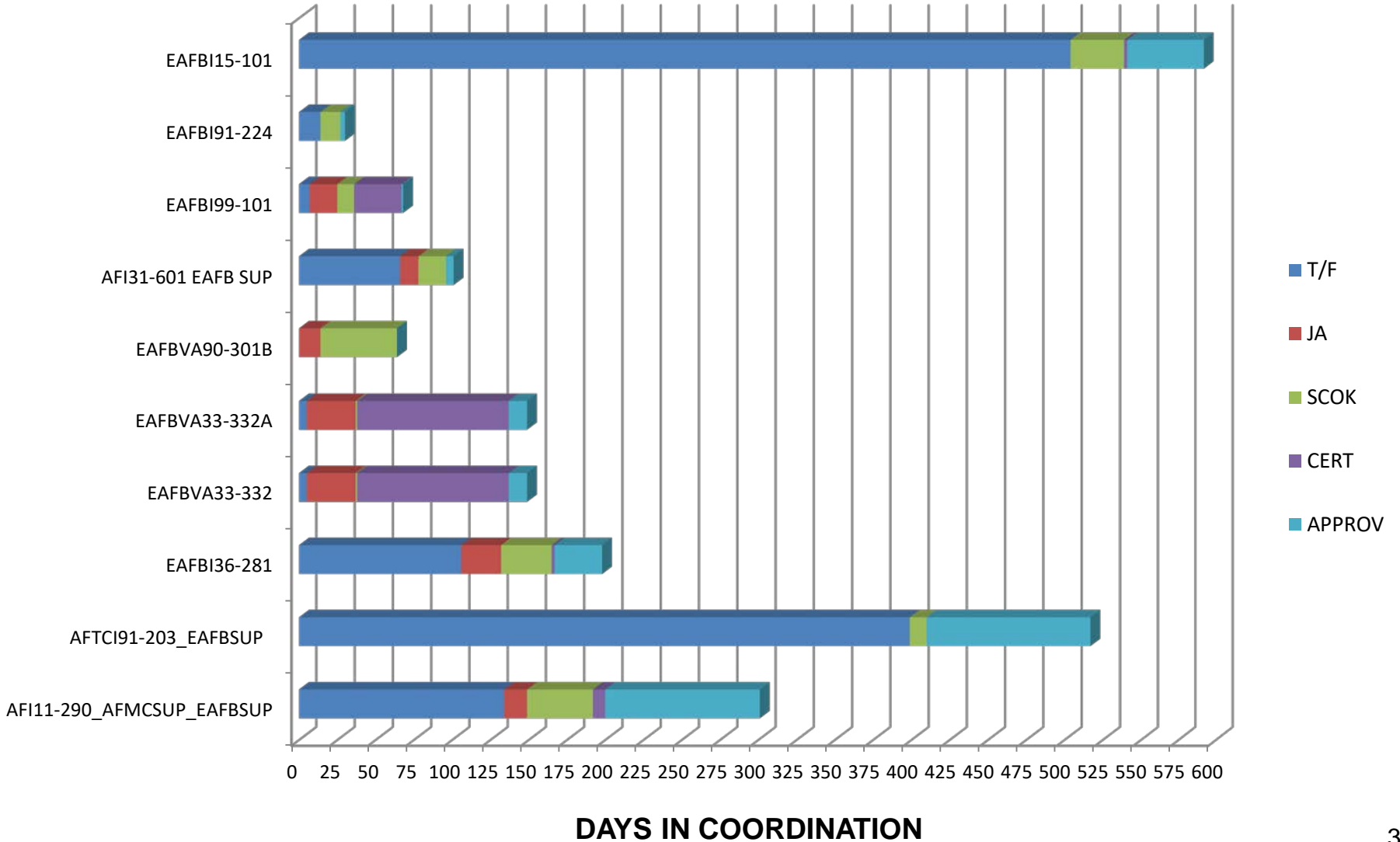


High-WIP Bad, Low-WIP Good



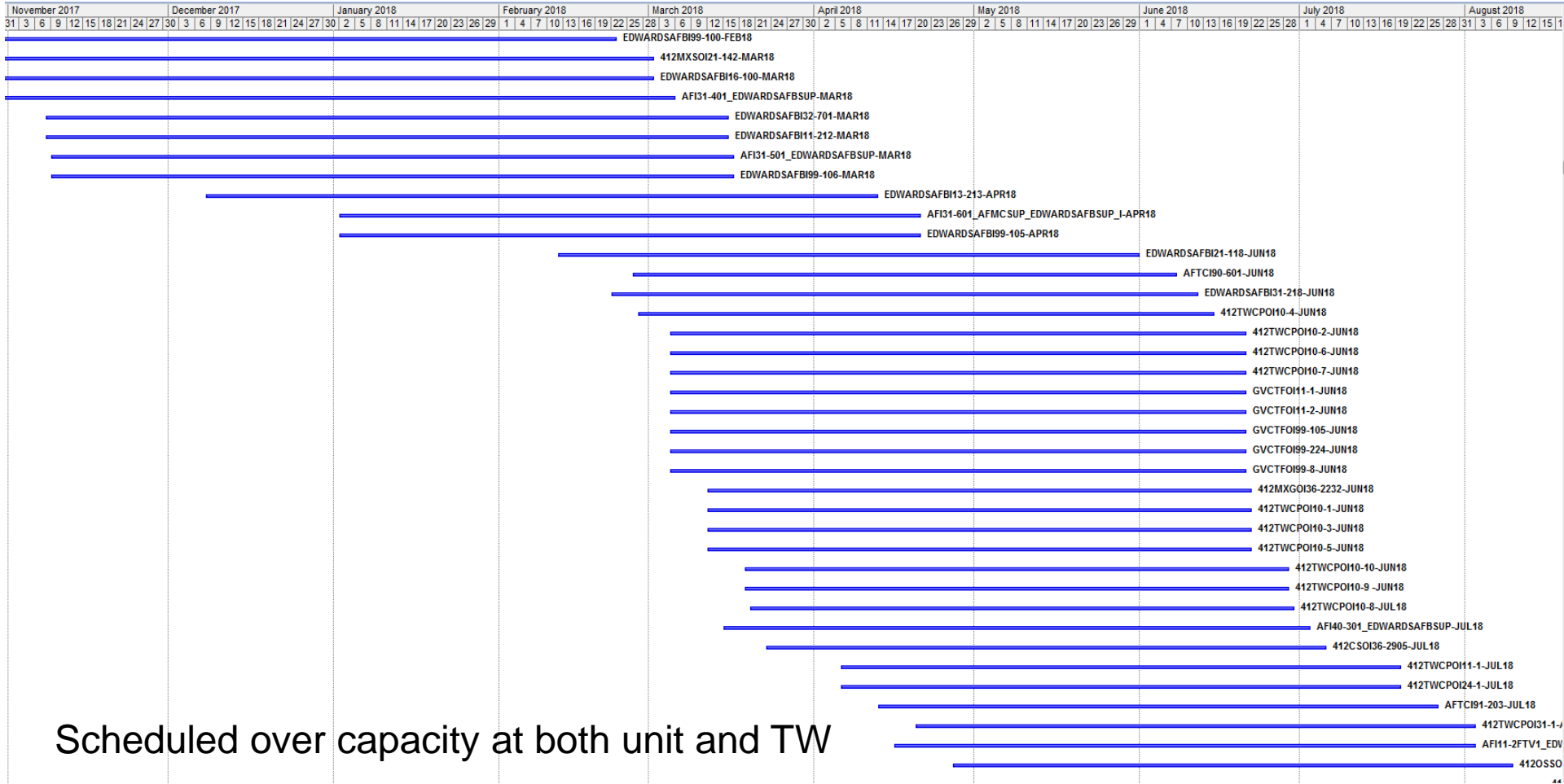


Issue – Long Delays





Problem - Pubs Portfolio is Overscheduled



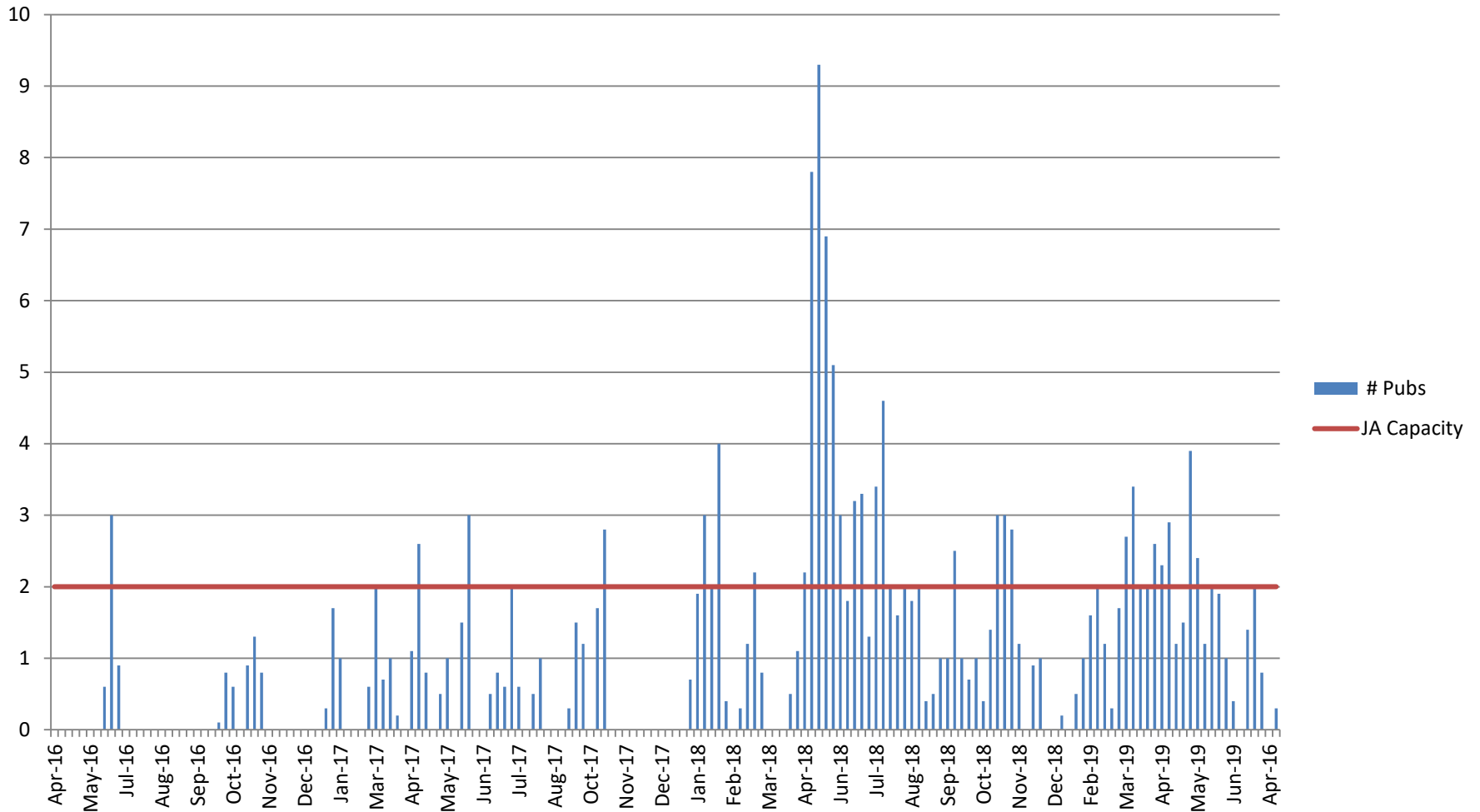
Scheduled over capacity at both unit and TW



Problem – Pubs Workload



JA Load for Pub Review - Unsynchronized



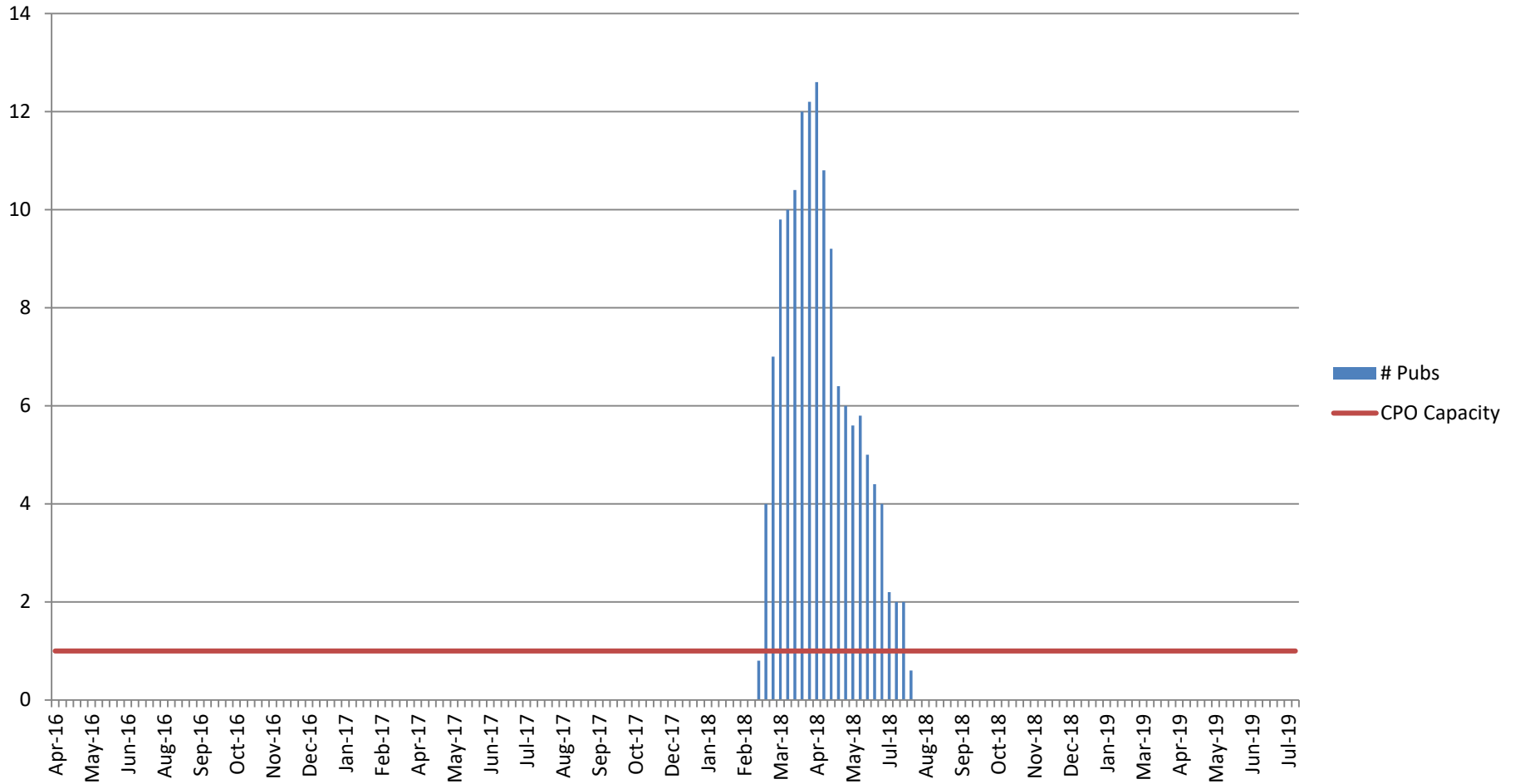
Workload – Unbalanced Portfolio



Problem – Unit Level Pubs Workload



CP Load for Pub Review - Current



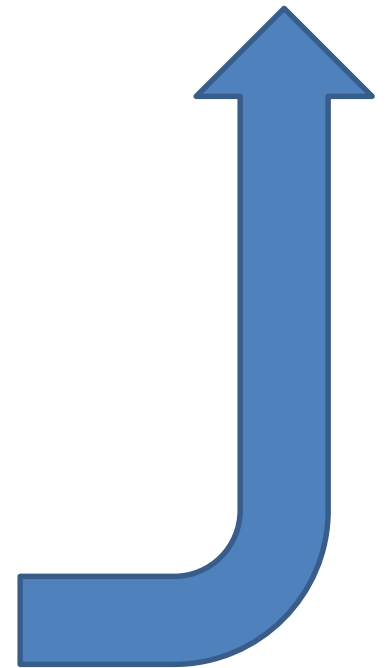
Current Workload – Unbalanced Portfolio



Problems



- Lead times are too long – avg 6 months coord time
 - Lack of process clarity
 - Early on: lack of priority and focus, little progress made
 - Near the suspense: not enough time, difficult to balance with other priorities
 - Unable to reliably meet due dates
- Lack of insight
 - High workload; low information
 - Difficult to determine status
- Workload peaks and valleys
 - The peaks are sometimes over capacity
 - Bottlenecks develop; delays happen





Background



- Test Wing Operating Instructions were not getting published on time
 - Average coordination taking 6 months
 - Delays implementation of AF and AFMC Instructions and Supplements
- AFSO21 Event Charter
 - Streamline the coordination requirements by 50% within 8 months



Path to a Solution



- AFSSO21 event completed: Reduce coord time to 90 days.
- 5 Jan - CCPM identified as a possible solution.
- 11 Feb - 412 CS/CC request TMG support for a CCPM implementation.
- 25 Feb – initial planning meeting for the implementation.
- 3 Mar – implementation kick-off.
- 3 Mar – 25 Apr Implementation.
- 25 Apr – CCPM Go-Live.
- 26 Apr ~ 1 Jun: Spin-up new procedures. TMG provides OJT and other assistance until SCOK able to fly solo.
- Follow on – TMG available as required to provide assistance and recurring training.



Ground Rules



1. Total commitment by the TW and the organization
2. We do this my way
3. We will finish what we start
4. When we run into a problem, we don't give up, we simply work the problem
5. The implementation is the highest priority in the organization
6. If there are other priorities that emerge, then see rule 4
7. We WILL succeed



Implementation Strategy



- Install a complete management solution tailored to the specific needs of the organization
 - Align with the 412th TW mission
 - Align with AFSO21 Event countermeasures
- Required elements of the solution
 - CONOPS – documents the design and operation of the complete system
 - Procedures
 - Training
 - Software tools
 - Proficient people
 - Disciplined execution



Solution Alignment with Organizational Goals



Goal

Support the 412th TW mission with current and timely Operating Instructions.

Desired Effects

Pubs complete on or before commitment dates

Mean cycle time of 90 days.

Methods

- Build realistic project schedules that fit cycle time goals
- Build a pubs portfolio that avoids overscheduling resources
- Manage the work
- Respond to delays through effective and rapid issue resolution



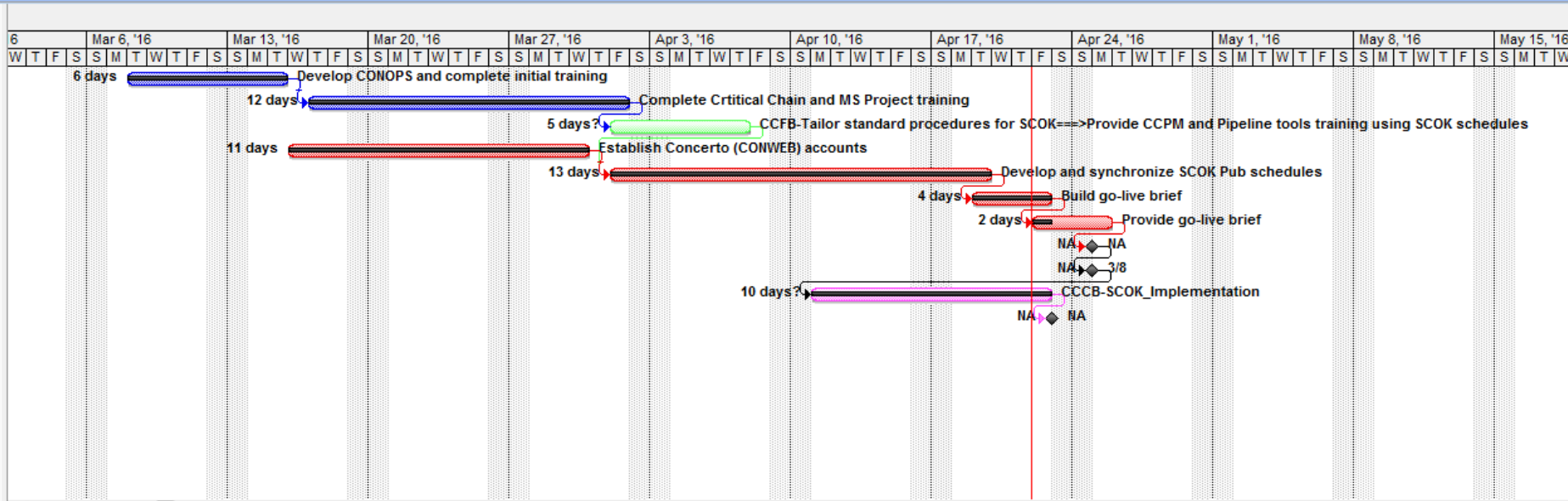
Strategy



- TW involvement
- Organizational commitment
- Train – Implement – Train – Implement
 - Training remains in context of the goal
 - Results in fully installed solution by the end of training
- Focus, energy, momentum – keep the “airspeed” up



Implementation Plan



- Approach: embed training within the implementation
 - Tools and procedures are developed as part of training
- Activities completed as part of training
 - Template build – reflects the CPI process map
 - Critical Chain schedules for 146 pubs
 - Synchronized portfolio schedule using all 146 schedules



Low WIP Solution - 4 Main Elements



1. Good project plan with a realistic (within assumptions) CCPM schedules
2. Synchronized publications portfolio (Low Work-In-Process)
 - a) Queue control
3. Execute and manage the work
4. Respond to issues quickly

All 4 elements must be operating for the solution to work.



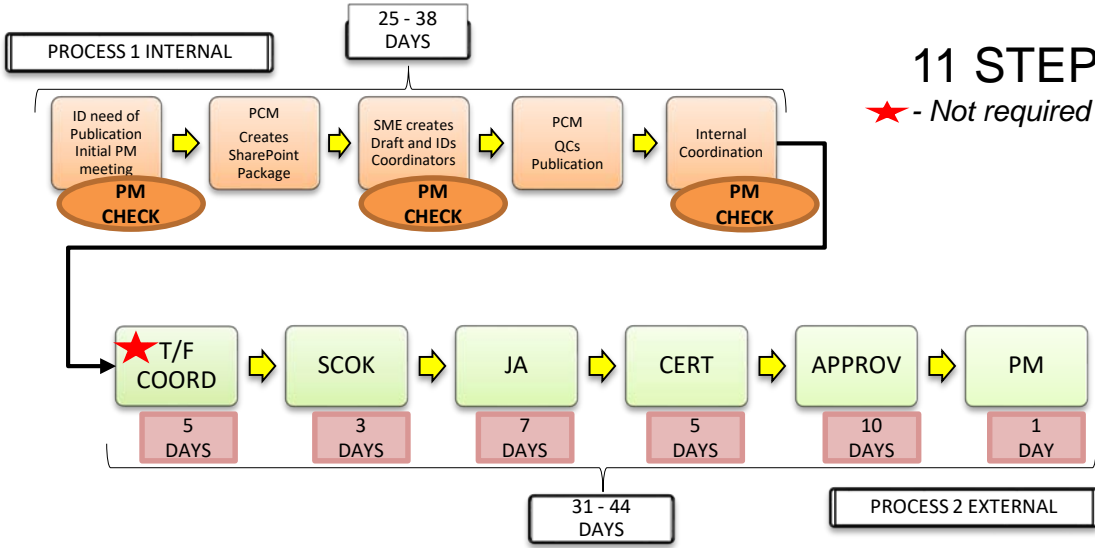
1. Good Project Plan



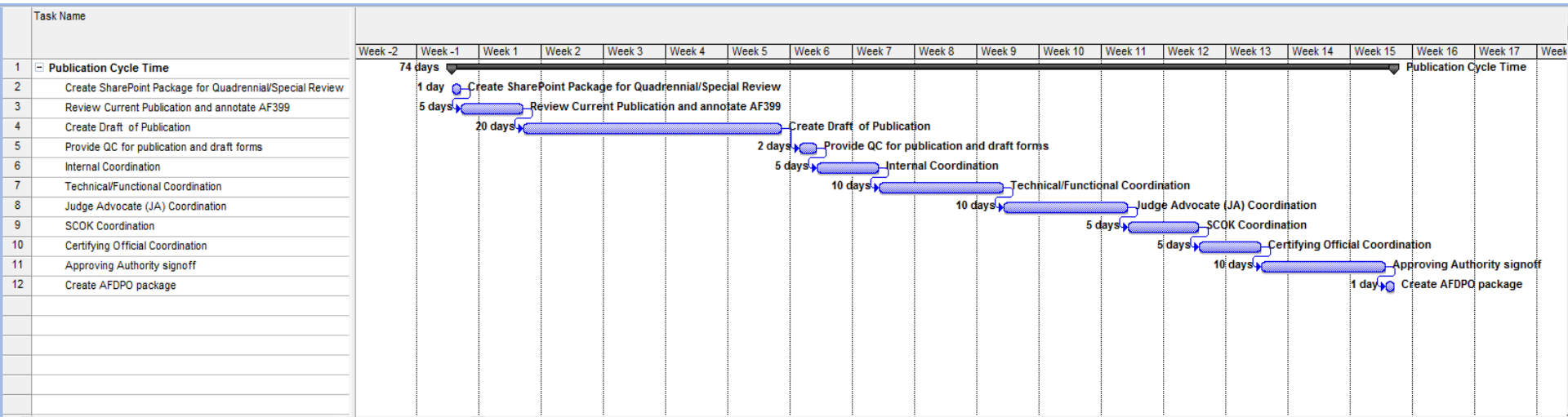
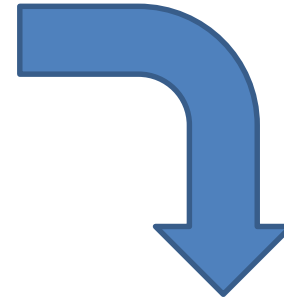
- Start with standard task template (determined from the AFSO21 event)
- Work with units to develop work scope
- Adjust the template based on the reality of the work required
 - Work volume
 - Time available
- Build the Critical Chain schedule
- Unit/SCOK agree to the overall plan and due date



Standard Pubs Template



11 STEPS
 ★ - Not required for Unit OIs





2. Plan a synchronized publications portfolio

- The Synchronization rule: Fit pub timelines within available resource capacity
 - Account for both unit and TW level resources
- Maintain flexibility on the overall portfolio schedule of all pubs
 - Pubs can trade places or “slots” in the portfolio schedule
 - The portfolio schedule can adjust for early/late finishes
 - **But the synchronization rule must remain**
- Account for pub priorities; adjust the portfolio schedule as necessary
- Do not violate the synchronization rule



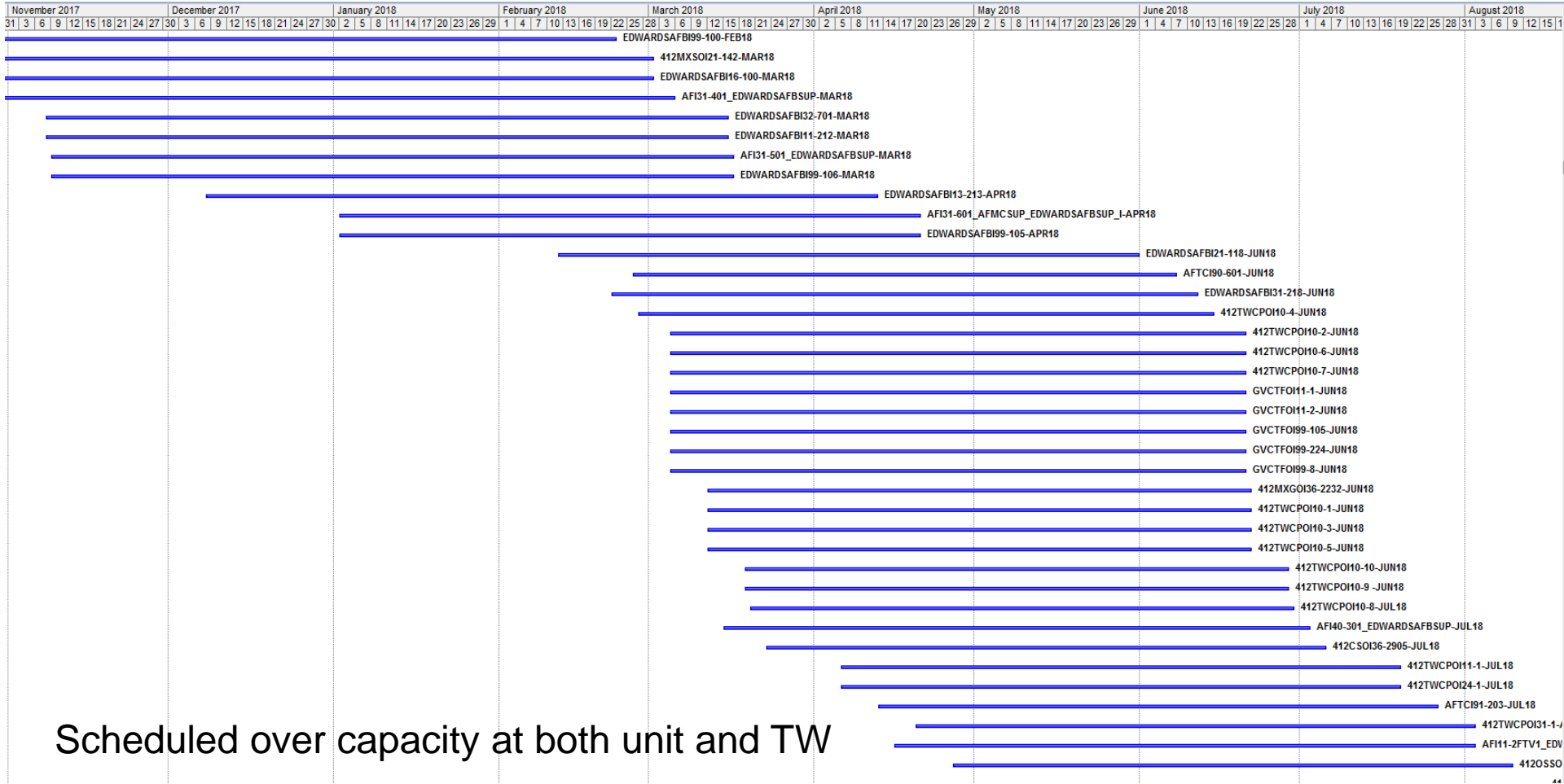
Synchronization: Portfolio Level Scheduling Decisions



- From a workload-capacity standpoint there are only 5 scheduling options to consider:
 1. Negotiate execution timeframes for some (lower priority) projects to maintain workload within capacity.
 2. Rebalance existing organizational capacity to meet workload demands across the organization.
 3. Add capacity to the organization to meet the anticipated increases in workload.
 4. Some combination of 1, 2, and/or 3.
 5. Change neither capacity nor project timing, i.e. do nothing – expect the workforce to service all of the work and produce results, regardless of workload.

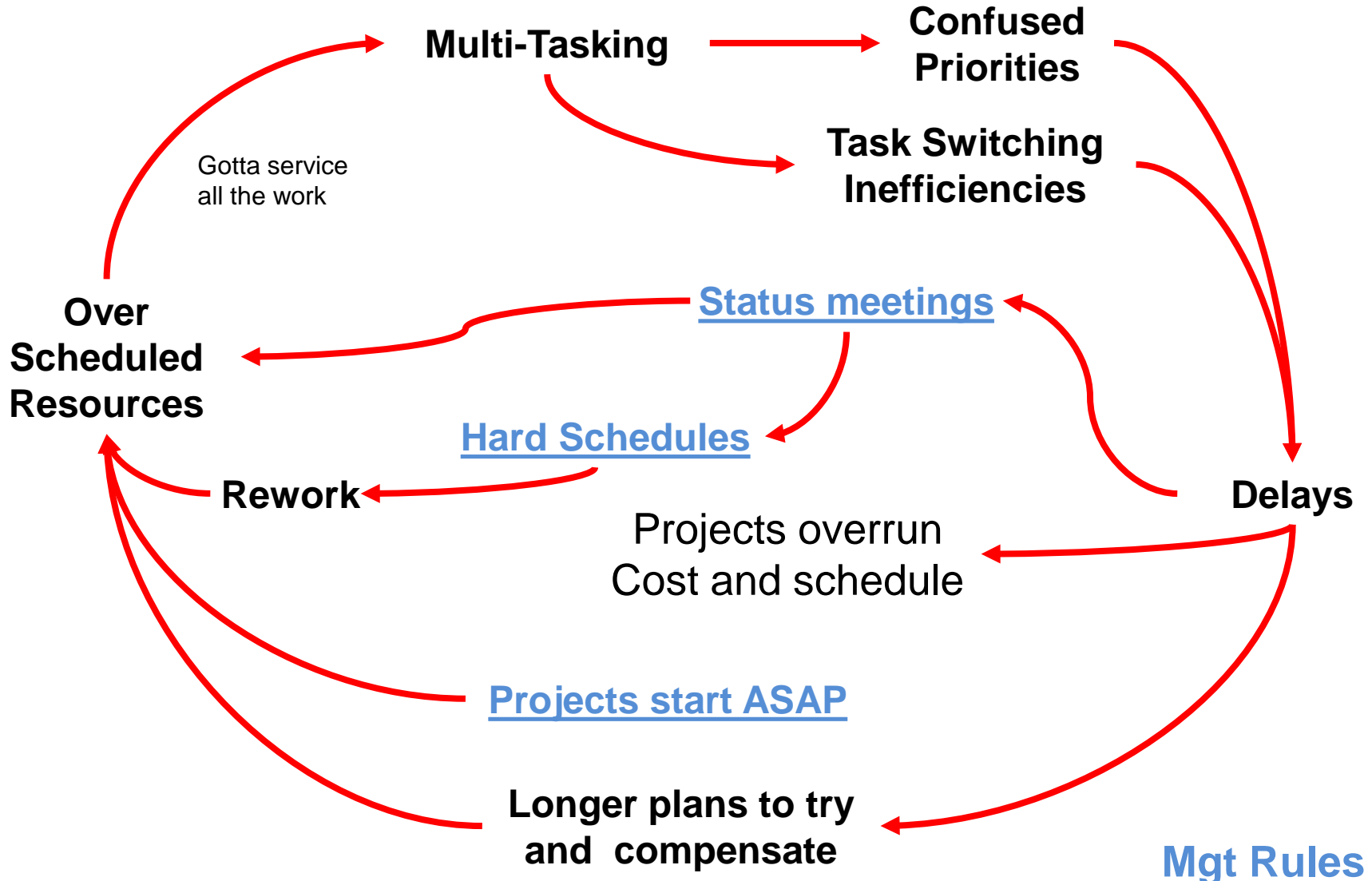


Problem - Pubs Portfolio Before Synchronization





The High-WIP Management Environment

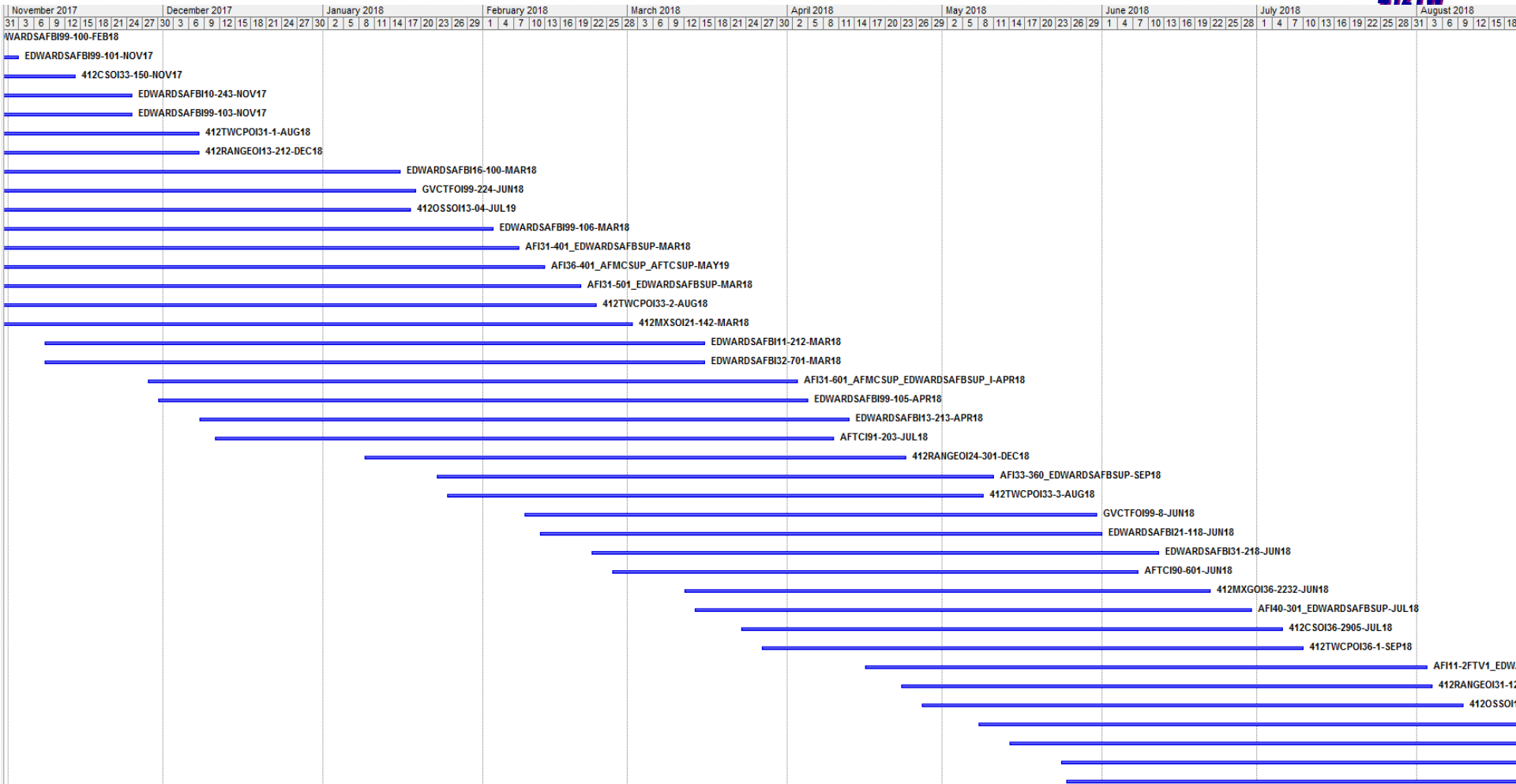




Pubs Portfolio After Synchronization



412TW



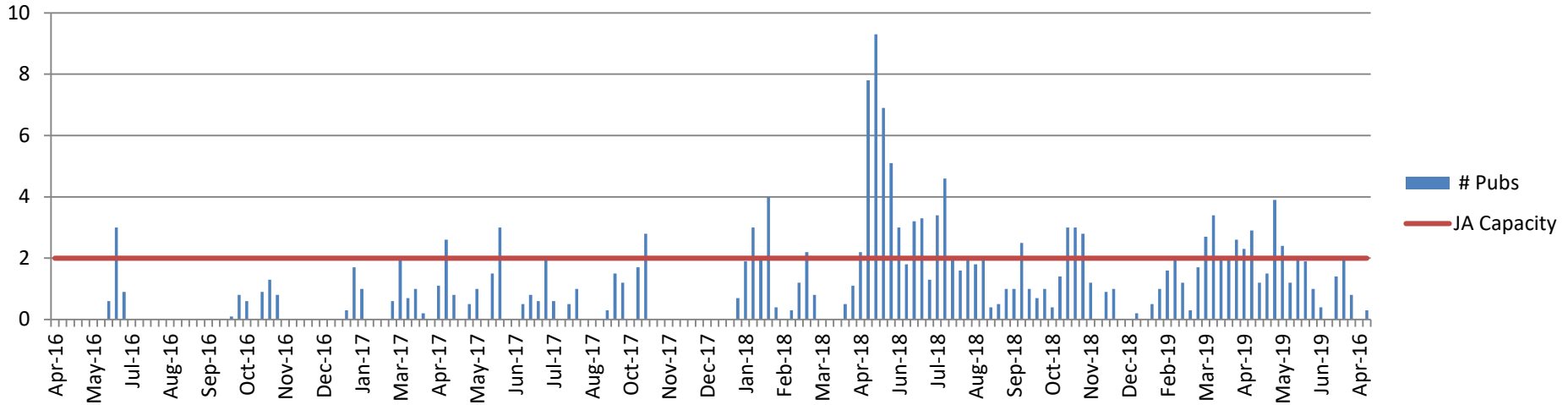
- Projects scheduled within capacity of the organization
 - Reset of the pubs review schedule will “reset” over time
 - Adhere to the project synchronization rule



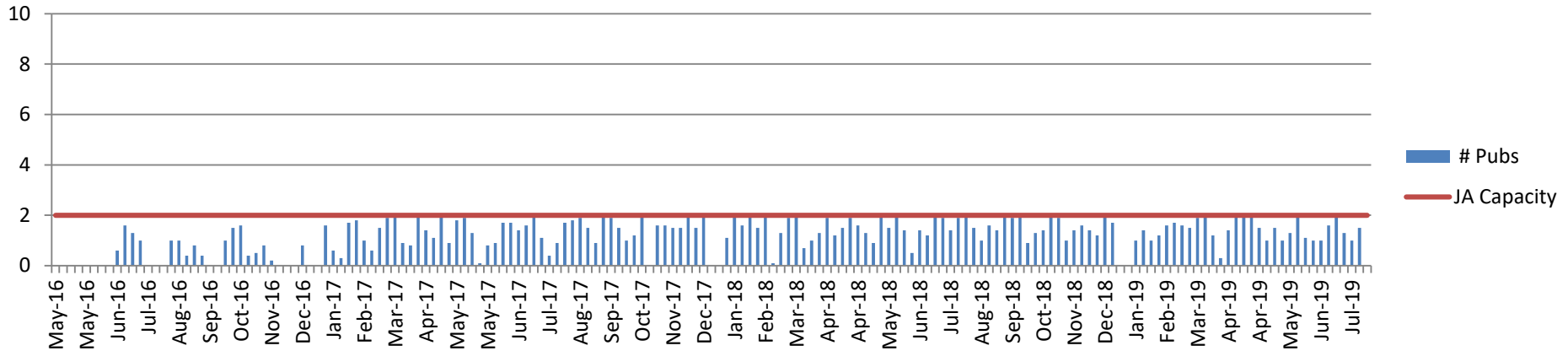
JA Workload



JA Load for Pub Review - Unsynchronized



JA Load for Pub Review - Synchronized

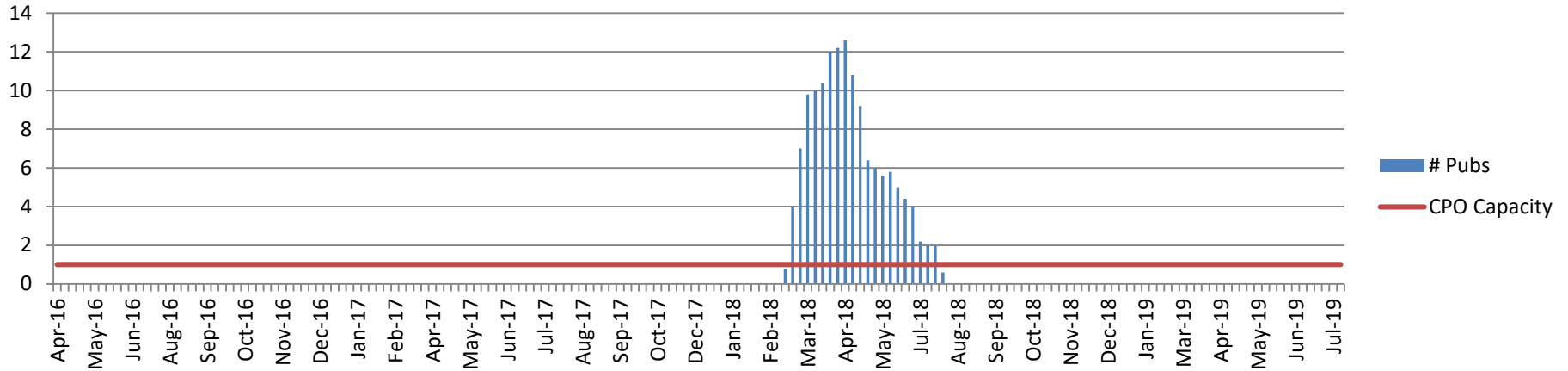




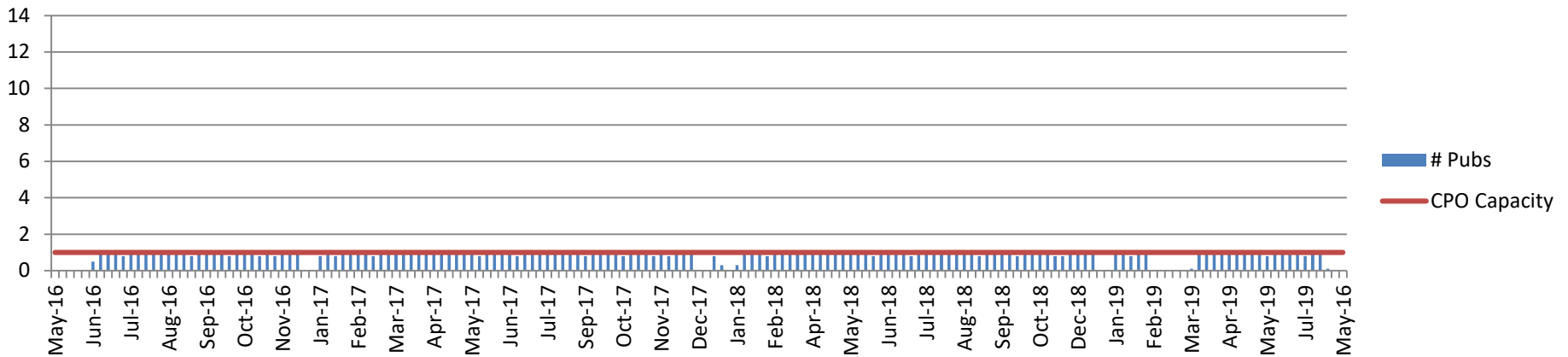
Unit Level Workload



CP Load for Pub Review - Current



CP Load for Pub Review - Synchronized





3. Execute and manage the work



- Increase communication/collaboration with the units
- Focus and accomplish the work based on clear priorities
- Drive to the overall due date, not individual task suspenses
- Provide in-process reviews as necessary to drive in quality and minimize rework
- Identify and respond to emerging schedule risk



4. Respond to issues quickly



- Frequent interaction with units will help surface issues before too much delay
- Resolve between PM (SCOK) and PCM (Unit)
- Elevate as necessary to understand issue and impact; resolve if possible



Roles & Responsibilities



- Organizational leadership
 - Drive the 4 key elements of the solution
 - Help resolve issues identified by SCOK
 - Ensure trained workforce in-place
- Unit PCMs and SCOK:
 - Define project requirements and scope
 - Adjust tasks based on the work required
 - Establish reasonable/achievable overall timeline
 - Identify resources and their availability to do the work
 - Execute with reasonable focus
 - Coordinate issues with leadership as required



Metrics



- Performance: are we achieving our org performance goals?
 - Cycle time trend
 - On-time performance trend
 - Cycle time histogram
- Operational: are projects on-track?
 - Buffer trend (schedule risk)
- Analytics: where are the delays? How much delay?
 - Delay Pareto
 - Delay trends



Lessons Learned



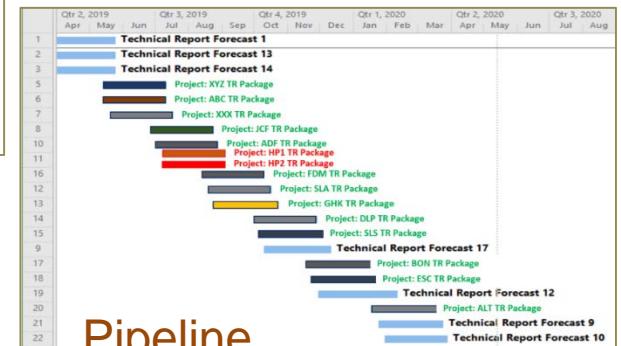
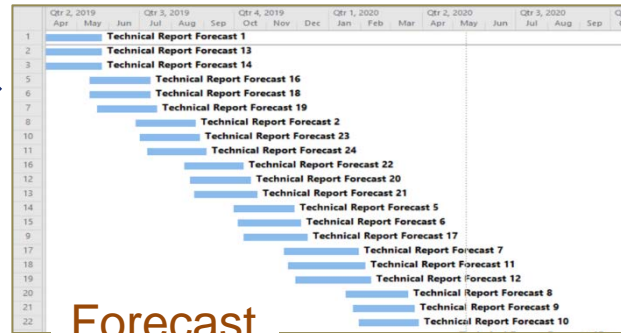
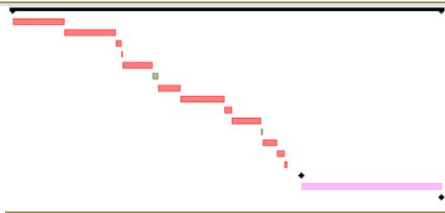
- ✓ Implementations (organizational change) can be successful under the right conditions
 - ✓ Hunger
 - ✓ A good plan
 - ✓ Expert led
 - ✓ Leadership commitment
 - ✓ Organizational commitment
 - ✓ High energy implementation
 - ✓ No plan is perfect – don't give up, just work the problem
 - ✓ Start up is the highest risk – maintain airspeed
 - ✓ On-going coaching and mentoring are essential
 - ✓ Don't fail



TR Pipeline Schedule

Managing Throughput with Queues

- Report 14
- Report: Complete Final Test Analysis and Evaluation
 - Report: Complete Technical Report (TR)
 - Report: Review TR for Coordination Meeting
 - Report: Distribute TR for Coordination Meeting
 - Report: TR Read-Ahead Time for Coordination Meeting
 - MIS-Report: Conduct Coordination Meeting
 - Report: Resolve Actions from Coordination Meeting
 - Report: Complete Revisions and Changes from Coordination Meeting
 - Report: Schedule Read: print and distribute report
 - Report: TR Read-Ahead Time for S&M
 - MIS-Report: Conduct S&M: TR approved
 - Report: Publish TR and send to TPOCC for approval
 - Report: TPOCC approves Budget TR
- Template





Questions?



Backup



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 1** - *Update supplement to AFI 33-360*
 1. Supplement will follow AFI
 2. Supplement will implement new procedures for Edwards AFB
 3. Guidance will mandate timelines
 4. Create a requirement for PCM and alternate appointment
 5. Require SMEs/PCMs/commanders to receive standardized training
 6. Require 3As or civilian equivalent to act as PCM
 7. Mandates the commander (or designee) as the certifier



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 2** - *Create lower-level guide (booklet format)*
 1. Created by publications managers, with input from team
 2. Identifies responsibilities for:
 - a. Commanders
 - b. PCMs
 - c. SMEs
 - d. Coordinators
 3. Miscellaneous



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 3** - *Identify procedures*
 1. Identify needed training (who, when etc.)
 2. Making process available (marketing)
 3. Identify tools that will be used (SharePoint, etc.)



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 4** - *Reengineer process for publications coordination*
 1. Setting timelines for each step in process
 2. Identify personnel for each step in process
 3. Ensure that process meets overall timeline set by Edwards AFB for new and revised publications



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 5** - *Reengineer SharePoint site*
 1. Create/update continuity libraries
 2. Create/update forms
 3. Create FAQ/Wiki section
 4. Ensure that auto-notification capability exists
 5. Create workflow
 6. Create ability to defer new pubs
 7. Create tracking tool



AFSO Event – Streamline Publications Process



- **COUNTERMEASURE 6** - *Create/update training*
 1. SMEs
 2. PCMs
 3. Commanders

REPORT DOCUMENTATION PAGE

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1. REPORT DATE (DD-MM-YYYY) 06/05/2019			2. REPORT TYPE Briefing slides		3. DATES COVERED (From - To) 14 – 16 May 2019	
4. TITLE AND SUBTITLE Controlling Work-In-Process: Multi-Project Scheduling					5a. CONTRACT NUMBER	
					5b. GRANT NUMBER	
					5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Archie Clark					5d. PROJECT NUMBER	
					5e. TASK NUMBER	
					5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES) 412th Test Wing 195 E Popson Ave Edwards AFB CA 93524					8. PERFORMING ORGANIZATION REPORT NUMBER 412TW-PA-19246	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 412th Test Wing 195 E Popson Ave Edwards AFB CA 93524					10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
					11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release A: distribution is unlimited.						
13. SUPPLEMENTARY NOTES 23rd Annual ITEA TIW (Test Instrumentation Workshop), Shaping the Future of T&E Las Vegas, NV, The Tuscany Suites and Conference Center, 255 E. Flamingo Rd, Las Vegas, NV 89169						
14. ABSTRACT This presentation will cover applying Theory of Constraints methods for transitioning to and maintaining low WIP in multi project, resource constrained portfolios. Lessons learned and real world examples are provided.						
15. SUBJECT TERMS ACRO(CCPM) ACRO(WIP) Portfolio Project Scheduling						
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT None		18. NUMBER OF PAGES 69	19a. NAME OF RESPONSIBLE PERSON 412 TENG/EN (Tech Pubs)
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified				19b. TELEPHONE NUMBER (include area code) 661-277-8615