

Administrative Changes to **SMCI 63-103**, *Software Acquisition Process Improvement Instruction*

OPR: SMC/EN

Global replace of “Wings/Groups and detachments” with “Directorate/Director”

26 APRIL 2011



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Acquisition**

**SOFTWARE ACQUISITION PROCESS
IMPROVEMENT INSTRUCTION**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction outlines the process to comply with the requirements of the Air Force Software Acquisition Process Improvement Strategy (SWAPI). It serves as a guide to standardize the Air Force Space Command (AFSPC) and Air Force Materiel Command (AFMC) roles and responsibilities. It applies to all Space and Missile Systems Center (SMC) Integrated Weapons System Management (IWSM) Wings (formerly System Program Offices (SPOs)), the 61st Communication Squadron, 61st Air Base Group and all organizations dealing with the acquisition of software intensive weapon systems, including the maintenance and sustainment. (This includes all programs and/or projects that fall under the Wings). The focus of this instruction is on the acquisition of the software that is an integral part of the weapon system. The implementation of this instruction is mandated by the Policy on Software Acquisition at SMC, dated 20 August 2004. See reference 2. Note: Tables 1 to 17 are not complete, but are examples of attachment 2 which is required.

SUMMARY OF CHANGES

1. Minor grammatical changes, document formatting, inserted hyperlinks to referenced attachments
2. Merged table 4 and 5, then renumbered the tables
3. Replaced the old table 20 (now table 19)
4. Replaced attachments 2, 3 and 4
5. In Acronym list, replaced CMMI[®]-AM with CMMI[®]-Acquisition
6. Added in Reference Numbers
7. Deleted 2.2, organization not active
8. Tables 1 - 20 were renumbered
9. Deleted the CMMI sentences in 1.2 as the CMMI-ACQ is not a replacement for this Inst.
10. In 3.2 modified the first 2 sentences as following to clarify.

11. Added in new 3.2.7 to address life cycle diagram in Figure 1. Since NSS 03-01 was rescinded, new Figure 1 depicts DODI 5000.02 instead of NSS 03-01.
12. Appended the following text to 3.3.1 Q2 and Attachment 2 “Describe the current software staff leadership in the wing and on the program.”
13. Deleted NSS 03-01 reference in 3.3.2 since it was rescinded.
14. In 3.2.2, added in for each sub-item or bullet after the (not to exceed a ½ page)
15. Deleted Lack of expectation management from Table 6. It was difficult to define and did not add any value
16. Modified 3.3.4 Q1 and same in attachment 2 to clarify the question.
17. Added footnote to attachment 2, “The format of this template is flexible. The content is required.”
18. Appended to the end of Q2 in 3.3.1 and in attachment 2, “Describe the current software staff leadership in the wing and on the program.”
19. Added the following to the end of the introductory paragraph “Note: Tables 1 to 17 are not complete, but are examples of attachment 2 which is required.”
20. Deleted the a., b., c. from Attachment 2, 3.3.2, Q2
21. Added to 3.3.2, Table 8, Q5 which reads “Q5. Describe how the wing is in compliance with the Clinger-Cohen Act (CCA).”
22. Reworded 3.3.3.2 to a more realistic 50% margin as in: “System maintainability and supportability issues need to be addressed early in the program. There needs to be a minimum of a 50% margin in processor, memory, and input/ output utilization.”
23. Reworded 2nd sentence of 3.3.4.2 to read: “Significant levels of reuse, usually overly optimistic, are often planned at program start and are not addressed in the successive stages of the acquisition cycle. Reused software is a significant source of risk to program cost and schedule.”
24. In Table 12, replace the use of the term **you** with the phrase the program
25. Deleted SDCE from table 14
26. Replaced table 19 revised table to clarify
27. Added CMMI[®], CMMI[®], and CMMI[®]-ACQ to the acronym list in attachment 1
28. Clarified section 3 to indicate that SWAPI reports are to be updated yearly
29. 3.3.4.1 reworded by James Haag, SMC/JA for clarification and to comply with new DoDI 5000.02.
30. Added in reference 8, SMCI 63-104, Software Acquisition

1. Objectives. This instruction is intended to improve the efficiency and effectiveness of SMC acquisition processes and software management. These processes are applied as an integral part of our systems engineering and capability acquisition processes.

- 1.1. This document has been tailored to address SMC’s unique acquisition requirements while retaining the wings’ maximum flexibility on the method of implementation of this instruction.
- 1.2. The wing is free to implement any process that adequately addresses each of the required areas in this instruction.

2. Headquarters Air Force (HQ AF) Oversight. The process flow for the software acquisition process improvement strategy consists of:

- 2.1. The Assistant Secretary of the Air Force / Acquisition (SAF/AQ) and the Undersecretary of the Air Force (SAF/US) will direct software acquisition policy.
- 2.2. The Air Force Software Intensive Systems Strategic Improvement Plan Working Group (AFSSIP) is responsible for coordinating headquarters level Integrated Process Teams with Representatives from SAF/AQ, AF CIO, Product Centers (AFMC/ASC, AFMC/ESC, AFSPC/SMC), AFMC/IT, AFOTEC, STSC, etc. and (SMC/AXE is a working member of this group) – This group

works the various acquisition issues, policies, etc and advises the AFSSG on the same. Refer to Attachment 3, titled “Headquarters Air Force (HQ AF) Oversight.”

3. Air Force Software Acquisition Process Improvement Strategy Process. Each SMC wing shall forward an electronic copy of their implementation plan and the completed metrics (e.g., Answered Questions and Stoplight Chart) from implementation of their AF Software Acquisition Improvement Process to Program Executive Officer (PEO) for Space and copy SMC/EAS (Acquisition Systems Engineering Division). The wing will brief the PEO for space during a Program Management Review (PMR) semi-annually. Wing personnel shall be ready to support their answers. The reporting process shall commence 6 months after the publishing of the original Software Acquisition Process Improvement Instruction, SMCI 63-103, dated 28 March 2005 **and shall repeat yearly**. The Metric process flow diagram is illustrated in Attachment 4.

3.1. **Process Area Content.** The process areas that need to be addressed, as a minimum, are shown below:

3.1.1. SAF/AQ Revitalizing the Software Aspects of Systems Engineering

Table 1. SAF/AQ Policy Items to be Addressed.

High Confidence Estimates Realistic Program Baselines Risk Management Capable Developer Developer Processes Wing/Group (i.e., originally named SMC Program Office) Processes Earned Value Management Applied to Software Metrics Life Cycle Support Lessons Learned AF Policy Compliance/Clinger-Cohen Act (CCA) Training
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3.1.2. Public Law 107-314, Section 804 (Bob Stump National Defense Authorization Act for Fiscal Year 2003) Process Areas (see reference 4).

Table 2. Section 804 Process Areas.

<p>DOCUMENTED PROCESS - A documented process for software acquisition planning</p> <p>METRICS - Develop appropriate metrics for performance measurement and continual process improvement</p> <p>EXPERIENCE & TRAINING - A process to ensure key program personnel have appropriate level of experience or training in software acquisition</p> <p>ENSURE ADHERENCE - A process to ensure implementation and adherence to established processes and requirements relating to the acquisition of software</p>
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3.1.3. Office of the Secretary of Defense (OSD) Acquisition Technology and Logistics (AT&L)/Command, Control, Communications, Intelligence (C3¹) Process Areas (see reference 3).

Table 3. Areas Addressed by OSD In Addition to Areas Required By Section 804.

<p>CONFIG MGMT - Configuration Management TEST AND EVALUATION - Test and Evaluation INTEGRATED TEAM MANAGEMENT – Not applicable at this time SOURCE SELECTION - Solicitation and source selection</p>
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3.2. **Instructions:** Each SMC wing shall complete the questionnaire (See the first 3 columns of Table 4. “Software Process “Desired” State Traceability Matrix” and Attachment 2). All responses/answers to the questions shall be in an editable format document (e.g., Microsoft Word, Editable Portable Document Format (PDF), Microsoft Excel). The suggested format is depicted in Attachment 2. The Matrix illustrates the short questions that need to be answered in the sections on: People, Training, and Experience; Policy and Guidance; Software Technology Development and Transition; Special Interest Items (e.g., Commercial Item (e.g., COTS - Commercial Off-The-Shelf)), Reuse, Security); Acquisition Processes and Compliance; Developer Process Compliance; and Metrics, Assessment, and Improvement. This matrix illustrates the mapping of the questions to the required compliance documents (OSD memo and Section 804). See references 3 and 4.

3.2.1. Personnel having questions in the areas described above should review the SMC Software Acquisition Handbook. See reference 6.

3.2.2. Each question is annotated by a prefix of ‘Qn’ and shall be answered by each program. Each answer should be 1 to 2 paragraphs (not to exceed a ½ page) for each sub-item or bullet. These responses will be used to determine how each program is complying with SWAPI requirements.

3.2.3. Small programs (i.e., typically with less than 10,000 Source Lines of Code) may generate a tailoring request with justification to the PEO for Space per the Dr. Sambur and Mr. Teets memorandum entitled Revitalizing the Software Aspects of Systems Engineering, dated 20 September 2004. See reference 1.

3.2.4. The following lessons learned information shall be delivered to the SMC Acquisition Center of Excellence (ACE) in an electronic format and on a schedule agreed to by both parties: including original estimates and delivered actuals for software size, effort, and schedule; program risks and mitigation approaches; objective description of factors such as added functional requirements; schedule perturbations; and any other program events that contributed to the successes and challenges of this program.

3.2.5. The stoplight chart (Example) in paragraph 3.4. is to be completed by each SMC wing. The template can be found in Attachment 2.

3.2.6. The terms and acronyms used for the traceability matrix below are in full caps.

3.2.7. A life cycle diagram marked to show the current position in the life cycle should accompany the stoplight chart. An example is shown in Figure 1 that is based on the 2008 version of DODI 5000.02. See reference 7.

Figure 1. Position in Life Cycle.

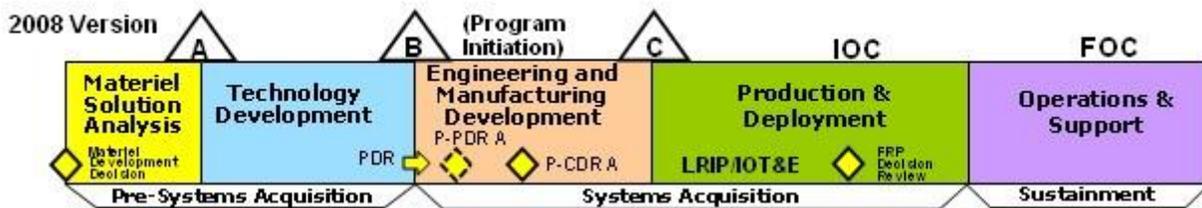


Table 4. Software Process "Desired" State traceability Matrix for:

1. AF SW Intensive Strategic Improvement Program

2. FY03 NDAA Section 804 or OSD AT&L/C3¹ Process Areas.

Process Area	Section #	Current State Survey	
			<ol style="list-style-type: none"> 1. AF SW Intensive Strategic Improvement Memo 2. FY03 NDAA Section 804 or OSD AT&L/C3¹ Process Areas
People, Training, & Experience	Q1 3.3.1	Describe how the required experience level is determined, how the training	<ol style="list-style-type: none"> 1. Wing Processes 2. Experience & Training
	Q2 3.3.1	Describe the wing's plan for <u>retaining</u> key staff, training new staff members	<ol style="list-style-type: none"> 1. Wing Processes 2. Experience & Training
	Q3 3.3.1	Describe how it is determined that wing staff personnel have the material resources	<ol style="list-style-type: none"> 1. Wing Processes 2. Ensure Adherence
Policy and Guidance	Q1 3.3.2	Describe how the wing addresses software policy as an integral part of systems engineering	<ol style="list-style-type: none"> 1. Wing Processes 2. Documented Processes
	Q2 3.3.2	Describe how the wing addresses software management and acquisition guidance, including:	
		a. The source of software acquisition and management guidance and recommended practices.	<ol style="list-style-type: none"> 1. Wing Processes 2. Documented Processes
	Q3 3.3.2	Describe how the wing addresses the following topics:	
		Budget and schedule estimates (80%-90% confidence), robust risk	<ol style="list-style-type: none"> 1. Realistic Program Baselines, Risk Mgmt & High Confidence 2. Documented Processes
	Q4 3.3.2	Describe how the wing tracks compliance to ensure they are adhering to the mandatory provisions of laws, policies, regulations, etc.	<ol style="list-style-type: none"> 1. Wing Processes 2. Ensure Adherence
	Q5 3.3.2	Describe how the wing is in compliance with the Clinger-Cohen Act (CCA)	<ol style="list-style-type: none"> 1. Ensure Adherence 2. Ensure Adherence
SW Tech Development and Transition	Q1 3.3.3	Describe how the wing verifies the contractor has a process for assessing the feasibility of meeting system performance requirements.	<ol style="list-style-type: none"> 1. Developer Processes, Wing Processes 2. Ensure Adherence
	Q2 3.3.3	Describe how the wing personnel have addressed maintainability and supportability issues	<ol style="list-style-type: none"> 1. Life Cycle Support 2. Documented Processes

Process Area	Section #	Current State Survey	
	Q3 3.3.3	Describe how the wing's personnel assure the system will have sufficient spare resources	1. AF SW Intensive Strategic Improvement Memo 2. FY03 NDAA Section 804 or OSD AT&L/C3I Process Areas
	Q4 3.3.3	Describe how wing's personnel are assigned to verify the system human interface/usability	1. Life Cycle Support 2. Ensure Adherence
Special Interest Items	Q1 3.3.4	Describe how the wing has addressed training areas that include how guidance, tailorable templates or examples, and training are established and easily accessed for Program Manager use on:	
		Commercial Items, GOTS, and open	1. Developer Process, Wing Processes 2. Experience & Training
	Q2 3.3.4	Describe how the wing verifies the risks associated with reuse, Commercial Items, GOTS, and open	1. Risk Management 2. Ensure Adherence
	Q3 3.3.4	Describe how the wing verifies the system supports the architecture and network-centric	1. Developer Processes, Wing Processes 2. Ensure Adherence
	Q4 3.3.4	Describe how the wing ensures that emphasis has been placed on software testing areas such as: early software testing	1. Ensure Adherence 2. Ensure Adherence
	Q5 3.3.4	Describe how the wing verifies that the contractor utilizes types of testing that will	1. Ensure Adherence 2. Ensure Adherence
Acquisition Processes and Compliance	Q1 3.3.5	Describe how the wing has incorporated software into its program acquisition strategy	1. Wing Processes 2. Ensure Adherence
	Q2 3.3.5	Describe the processes the wing is using for software acquisition as an integral part of the system acquisition, including processes for software acquisition planning, requirements	1. Wing Processes 2. Documented Processes, CM, SRC Selection, Test & Evaluation
	Q3 3.3.5	Describe the techniques the wing is using to develop an independent program software size, cost, and schedule estimate	1. Realistic Program Baselines 2. Documented Processes

Process Area	Section #	Current State Survey		<ol style="list-style-type: none"> 1. AF SW Intensive Strategic Improvement Memo 2. FY03 NDAA Section 804 or OSD AT&L/C3I Process Areas
Developer Process Compliance	Q1 3.3.6	Describe how the wing establishes guidance and methods for evaluating contractor capability, capacity, and commitment to disciplined development processes in source selection to include: Requiring the IMP, System Engineering Management Plan, and Software Development Plan as:		
		Part of the proposal, evaluating them during source selection, and making them contractually binding	<ol style="list-style-type: none"> 1. Capable Developer 2. Documented Processes SRC Selection 	
	Q2 3.3.6	Describe how the wing ensures all development contractors have defined, documented, applied, and enforced disciplined processes.	<ol style="list-style-type: none"> 1. Capable Developer 2. Documented Processes & Ensure Adherence 	
	Q3 3.3.6	Describe how the wing establishes the developer's capability to support periodic independent assessments of	<ol style="list-style-type: none"> 1. Capable Developer 2. Ensure Adherence, Experience & Training 	
	Q4 3.3.6	Describe how the wing tracks whether the wing and the contractor team(s) execute within cost	<ol style="list-style-type: none"> 1. Realistic Program Baselines & Wing Processes 2. Ensure Adherence & CM 	
Metrics, Assessment, and Improvement	Q1 3.3.7	Describe how the wing uses the results from independent program assessments prior to key system milestones:		
		Used as preventive measures	<ol style="list-style-type: none"> 1. Wing Processes 2. Metrics & Ensure Adherence 	
	Q2 3.3.7	Describe how the wing defines and publishes expectations for acquisition process improvement	<ol style="list-style-type: none"> 1. Wing Processes 2. Metrics & Documented Processes 	
	Q3 3.3.7	Describe the software-intensive system acquisition-related metrics the wing uses.	<ol style="list-style-type: none"> 1. Metrics 2. Metrics, Ensure Adherence, Test & Evaluation 	
	Q4 3.3.7	Describe how the wing sets metric objectives and thresholds and how the wing uses the metrics	<ol style="list-style-type: none"> 1. Metrics 2. Metrics & Documented Processes 	
Q5 3.3.7	Describe how the wing determines and uses the software cost/schedule earned value	<ol style="list-style-type: none"> 1. Earned Value Management 2. Metrics & Documented Processes 		

3.3. **Wing Areas This Instruction Addresses:** The text before the questions for each process area (e.g., 3.3.1.) is for guidance purposes, not as mandated requirements.

3.3.1. **People, Training, and Experience:** Wing personnel need to have adequate training for their part in the acquisition. Each person as a minimum needs to have the appropriate Certified Acquisition Professional Level. The wing needs to identify the minimum training level/degree requirements/certification requirements for each position in their organization.

3.3.1.1. Staff Experience needs to be analyzed to assess whether the personnel assigned to the project possess the experience necessary to acquire a system that meets customer needs.

3.3.1.2. Critical skills need to be identified at the start of a project. The availability of appropriate skills for each task needs to be evaluated.

3.3.1.3. Staff turnover needs to be monitored, both from a retirement and morale perspective (i.e., we need to be careful about age-related metrics). A high turnover rate for younger employees could be indicative of a morale/management problem.

3.3.1.4. Staff retention can be a critical factor in the success of a software development or maintenance program. It is important that the program have a plan for retaining key staff, training new staff members, cross training personnel, and ensuring staff personnel have the appropriate security clearances.

3.3.1.5. When dealing with staffing issues, it is important to address the following critical areas:

Table 5. People, Training, and Experience Section Questions to Answer.

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| <p>Q1. Describe how the required experience level is determined, how the training level of wing personnel is being tracked, and how these personnel are being trained (also identify where no training is being provided).</p> <p>Q2. Describe the wing's plan for retaining key staff, training new staff members, and performing cross training. Describe the current software staff leadership in the wing and on the program.</p> <p>Q3. Describe how it is determined that the staff personnel have the material resources to accomplish their job (i.e., computers, copiers, Internet Access, reliable email, development and test tools, network support such as ftp, SecureID, Kerberos, support).</p> |
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3.3.2. **Policy and Guidance:** There is a significant need for Department of Defense (DoD) and Air Force policy and guidance directly related to software management and acquisition. A lack of software-related policy needs to be viewed by the wing as a major contributor to failure to meet expectations. Well-defined policy and guidance on software management and acquisition will minimize non-value-added software acquisition activities and focus the wing on universally prescribed methods that have real value to the software management. The Clinger-Cohen Act is designed to improve the way the Federal Government acquires and manages information technology. It requires individual programs to use performance based management principles for acquiring information technology. See Table 11 of SMCI 63-104 for a simple Clinger-Cohen Act compliance list. Contributors to program failure and poor software acquisition performance resulting from poorly defined policy and guidance include:

Table 6. Example Areas Under Policy And Guidance.

Unrealistic estimates of software development size, effort, and/or schedule are reflected in program baselines
 Requirements volatility and lack of related adjustments to baselines
 Contractor's lack of or weak application domain expertise
 External interfaces (suppliers) outside the control of the Program Manager
 Inadequate risk management

3.3.2.1. The following questions ensure the wing properly addresses software management and acquisition policy and guidance:

Table 7. Policy and Guidance Section Questions To Answer.

- Q1. Describe how the wing addresses software policy as an integral part of systems engineering, and applies all tenets of systems engineering to software.
- Q2. Describe how the wing addresses software management and acquisition guidance, including:
- The source of software acquisition and management guidance and recommended practices
 - How the wing consolidates this guidance and practices and tailors it for the various wing components
 - References to any examples and templates the wing uses to ease application of guidance and practices
- Q3. Describe how the wing addresses the following topics:
- Budget and schedule estimates (80%-90% confidence)
 - Application of lessons learned with respect to software size growth
 - Participation of application domain experts in program estimates
 - Adjusting budget and schedule when requirements change
 - Robust risk management program
 - Requirements and expectation management process involving wing, user, and prime contractor personnel
 - Studying lessons learned from previous programs before planning and during execution
 - Incentives and award fee
- Q4. Describe how the wing tracks compliance to ensure they are adhering to the mandatory provisions of laws, policies, regulations, etc.
- Q5. Describe how the wing is in compliance with the Clinger-Cohen Act (CCA)

3.3.3. Software Technology Development and Transition: During planning and requirements analysis stages, the feasibility of meeting system-performance requirements must be assessed (e.g., does the satellite sensor detect the correct number of targets in the required time and range limitations.). Wing personnel need to note that performance for the new system can be projected with modeling and simulation techniques and need to make sure the contractor addresses these issues.

3.3.3.1. It is critical for the wing to verify the contractor has a process for assessing the feasibility of meeting system performance requirements.

3.3.3.2. System maintainability and supportability issues need to be addressed early in the program. There needs to be a minimum of a 50% margin in processor, memory, and input/output utilization.

3.3.3.3. A system's user interface needs to consider the human being as required by 36 C.F.R. §§1194.21 and 1194.41, unless otherwise excepted.

3.3.3.4. The following questions ensure the wing properly addresses Software Technology Development and Transition:

Table 8. Software Technology Development and Transition Section Questions to Answer.

- Q1. Describe how the wing verified the contractor has a process for assessing the feasibility of meeting system performance requirements.
- Q2. Describe how wing personnel have addressed maintainability and supportability issues (e.g., Contractor Logistic Support, access to design documentation).
- Q3. Describe how wing personnel assure the system will have sufficient spare resources for future expansion (e.g., using only 50% of available memory, 50% of performance timing available)
- Q4. Describe how wing personnel are assigned to verify the system being acquired from the contractor(s) has taken human interface/usability into account.
- Q5. Describe how the wing is in compliance with the Clinger-Cohen Act (CCA).

3.3.4. Special Interest Items (Commercial Item (e.g., COTS – Commercial Off-The-Shelf), Reuse, Security and Software Test): The use of Commercial Item, reuse software, software security and software test issues needs to be thoroughly addressed by the wing to ensure the software risk is clearly identified and controlled and the software related requirements are met. The wing must ensure that well-defined processes are in place to address these software critical areas.

3.3.4.1. Commercial Item software in widespread use involves applications interfaces to Government Off-The-Shelf (GOTS) software, operating systems, device drivers, etc. However, Commercial Items are still a source of risk in terms of long-term viability and supportability, quality, etc. Note that when a Commercial Item is recompiled, it is no longer a Commercial Item. Any modification of Commercial Off-The-Shelf (COTS) software means that the item is no longer COTS. Rights acquired to Commercial item software shall be (1) consistent with the program's Data Management Strategy required by DoDI 5000.02 and (2) acquired under licenses customarily provided to the public unless those licenses do not satisfy the user's minimum needs or are inconsistent with Federal procurement law. For further details, See reference 8.

3.3.4.2. Software reuse is widely encouraged to reduce cost of development and to expedite the development effort. Significant levels of reuse, usually overly optimistic, are often planned at program start and are not addressed in the successive stages of the acquisition cycle. Reused software is a significant source of risk to program cost and schedule.

3.3.4.3. Some systems use software developed by foreign contractors with no defined traceability to the actual developer, thus causing significant information assurance concerns. Some systems release software to foreign Governments using applicable Secretary of the Air Force/Information Assurance (SAF/IA) policy.

3.3.4.4. Architecture and net-centric paradigms are not yet well understood and applied. Methods in place do not yet support effective analyses and implementation trade-offs of software intensive systems.

3.3.4.5. An effective software testing program will identify the correctness, completeness, security and quality of the developed system software and minimize risk to the program mission. Although testing varies between organizations, software testing needs to be emphasized. Emphasizing the proper software testing areas and ensuring that the contractor utilizes types of testing that will adequately test the system software will minimize risk to the program mission.

3.3.4.6. The following questions ensure the wing properly addresses Commercial Items, reuse, software security and software testing:

Table 9. Special Interest Items Section Questions to Answer.

<p>Q1. Describe for each item how the wing has established (determined and provided): (1) guidance; (2) tailorable templates or examples; (3) training; and (4) made them easily accessed (made available) for use: Commercial Items, GOTS; open source software, software from foreign sources, reuse application and impacts, system architecture, and information assurance. Although all special interest items must be addressed, be sure to fully address these two special items: software from foreign sources and information assurance.</p> <p>Q2. Describe how the wing verifies the risks associated with reuse, Commercial Items, GOTS, and open source software, and information assurance. Describe how the wing verifies that foreign-developed software is identified and understood, and how the risks are mitigated.</p> <p>Q3. Describe how the wing verifies the system supports the architecture and network-centric paradigm to include analysis and implementation trade-offs.</p> <p>Q4. Describe how the wing ensures that emphasis has been placed on software testing areas such as: early software testing, test planning, test strategy, test plans, test bed development, test procedures, test scenarios, test cases and metrics.</p> <p>Q5. Describe how the wing verifies that the contractor utilizes types of testing that will adequately test the system software. Types of testing include: white box black box, stress, positive/negative, boundary and system.</p>

3.3.5. **Acquisition Processes and Compliance:** Processes to ensure acquisition process compliance have generally not been established across the Air Force. Some of the existing problems with acquisition processes and compliance include:

Table 10. Example Areas Under Acquisition Processes and Compliance.

<p>Lessons learned focus is lacking</p> <p>Functions allocated to software are often assumed achievable and not fully considered in the requirements trade space</p> <p>There is little attention to sustainment</p> <p>Only mixed results are achieved in software acquisition</p> <p>Software acquisition processes are not prescribed:</p> <ul style="list-style-type: none"> Presence and effectiveness of documented processes is inconsistent, and results are dependent upon personalities Relationship between documented acquisition processes and program success is not established
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3.3.5.1. The software acquisition and management processes, which are established within the wing and directorate, need to ensure that:

Table 11. Areas That Need to be Addressed by SW Acquisition & Management Process.

<p>Realistic and achievable program baselines are used Risks associated with complexity and unprecedented capability are identified Requirements definition, management, and growth issues are managed Software acquisition processes are defined, documented, and institutionalized A metrics “starter set” (with examples) is used and monitored for effective application Improvement activities are included when warranted The system is successfully supported and operated within evolutionary acquisition constructs Lessons learned are captured effectively</p>
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3.3.5.2. The Software Acquisition Management Plan (SWAMP) provides a strategy and process to perform acquisition management oversight of the contractor(s) for the entire acquisition life cycle. The SWAMP specifically defines for the wing what to assess and how to do it. The SWAMP focuses on total software and related systems engineering capability and execution, the program selection process, risk reduction, bidders’ or contractors’ products and processes, and compliance guidance to Air Force and DoD acquisition policies. For addition information, refer to the SMC Software Acquisition Handbook. See reference 6.

3.3.5.2.1. The following questions ensure the wing properly addresses Acquisition Processes and Compliance:

Table 12. Acquisition Processes and Compliance Section Questions to Answer.

<p>Q1. Describe how the wing has incorporated software into its program acquisition strategy (including software development, test, and support strategies) and Request for Proposal (RFP(s)) (including Statement of Work and Statement of Objective (SOW and SOO), standards and other compliance documents, Contracts Data Requirements List (CDRL) items and associated Data Item Descriptions (DIDs), award and incentive fees, and evaluation criteria).</p> <p>Q2. Describe the processes the wing is using for software acquisition as an integral part of the system acquisition, including processes for software acquisition planning, requirements development and management, risk management, configuration management, solicitation and source selection, contract monitoring, and test and evaluation. Please provide a reference to the Software Acquisition Management Plan (SWAMP) that the program is using to manage the acquisition throughout the life cycle.</p> <p>Q3. Describe the techniques the wing is using to develop an independent Program software size, cost, and schedule estimate and to evaluate the contractors’ estimates of size, cost and schedule for realism.</p>

3.3.6. **Developer Process Compliance:** The contractors’ process capability and capacity must be understood in a consistent manner or method. Simply relying on Capability Maturity Model (CMM®)/CMMI® level without adequate examination or understanding can undermine the contractor oversight process. See reference 5. Multiple factors affect developer compliance with defined processes that include:

Table 13. Some Factors That Affect Developer Compliance.

<p>Ineffective application of Integrated Master Plan/Integrated Master Schedule (IMP/IMS) Inconsistent/inadequate insight into the contractor team members' software processes Cost and schedule pressures Not tracking or participating in processes for finding and removing defects early in the process</p>
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3.3.6.1. The following questions ensure the wing properly addresses developer process compliance:

Table 14. Developer Process Compliance Section Questions to Answer.

<p>Q1. Describe how the wing establishes guidance and methods for evaluating contractor capability, capacity, and commitment to disciplined development processes in source selection to include: Requiring the IMP, System Engineering Management Plan, and Software Development Plan as:</p> <ul style="list-style-type: none"> Part of the proposal, evaluating them during source selection, and making them contractually binding. Identifying and addressing strengths, weaknesses, and risks. Evaluating the contractor teams' software capabilities, both for source selection and contract monitoring (e.g., use of CMMI[®], other techniques). <p>Q2. Describe how the wing ensures all development contractors have defined, documented, applied, and enforced disciplined processes.</p> <p>Q3. Describe how the wing establishes the capability to support periodic independent assessments of developer capability and capacity, based on PEO/program manager demand.</p> <p>Q4. Describe how the wing tracks whether the wing and the contractor team(s) execute within cost, schedule, and performance baselines and how corrections are made (including configuration management).</p>

3.3.7. Metrics, Assessment, and Improvement

Table 15. Measurement, Assessment and Improvement Needs.

<p>A standard set of metrics that can be applied across all programs Large-scale acquisition process improvement using formal models (e.g., CMMI[®]-Acquisition Model (ACQ)) Consistent application of assessment to determine the process maturity of acquisition organizations</p>

3.3.7.1. Established metrics are generally used to monitor contractor efforts rather than Wing acquisition processes, resulting in inconsistent application and effectiveness of metrics that are in place to monitor acquisition programs. In the past, a consistent assessment method has not been applied to determine the maturity of acquisition organization's processes.

3.3.7.2. Improvement activities are underway at several centers to focus on revitalizing systems engineering. However, even though improvement activities are gaining momentum, software is not explicitly addressed. Large-scale acquisition process improvement using formal models is rare, and formalized process improvement is not a priority in the current environ-

ment of high ops-tempo, acquisition workforce downsizing, etc. In addition, wing process improvement metrics are not consistent, required, or defined.

3.3.7.2.1. Earned Value provides a uniform unit of measure for reporting the progress of a project. It provides the basis for cost and schedule performance analysis. If you want to know what's happening to the cost of your project BEFORE it is completed, you need to know what the planned cost at any time was, what the cost of the completed work is, and the value of the work actually completed. The units are usually work hours and dollars.

3.3.7.3. The wing must ensure the use of standard software metrics as an integral part of program execution and risk management to include:

Table 16. Desired Characteristics of Software Metrics Usage.

Integration with systems engineering requirements and approaches.
 Integration with lessons learned to help better predict cost, schedule, and performance related to software.
 Consistent application across prime contractors and subcontractors, as applicable (e.g., software defects).

3.3.7.4. The following questions ensure the wing properly addresses metrics, assessment, and improvement:

Table 17. Metrics, Assessment, and Improvement Section Questions to Answer.

- Q1. Describe how the wing uses the results from independent program assessments prior to key system milestones:

as a preventive measure

to identify strengths, weaknesses, and risks relevant to the phase of the program
- Q2. Describe how the wing defines and publishes expectations for acquisition process improvement to focus on improving the team's ability to rapidly deliver war-fighting capability.
- Q3. Describe the software-intensive system acquisition-related metrics the wing uses. Include both (a) metrics used within the program(s) to assess the acquisition processes, as well as (b) metrics used to measure the contractor's software development activities. Include metrics related to acquisition process compliance, software progress (design, coding, and testing), software development effort, staffing profiles, cost, schedule, software size, risk management, computer resource utilization, requirements volatility and management, testing, defects, quality, development team capability, and complexity.
- Q4. Describe how the wing sets metrics objectives and thresholds and how the wing uses the metrics (including objectives, thresholds, plans, actuals, and historical data) to manage the acquisition, development, and, if applicable, sustainment, and describe how the metrics are used to influence program decisions.
- Q5. Describe how the wing determines and uses the software cost/schedule earned value (e.g., schedule performance index and cost performance index at the software level).

3.4. Compliance with Air Force Software Acquisition Process Improvement Requirements:
The SMC SWAPI point of contact (POC) will complete a Stoplight Chart for each system. The system names below are examples and are to be replaced by the wing's system names.

Table 18. Evaluation Criteria Descriptions.

Poorly Compliant (<50%)	Means that less than 50% of the issues in the question are adequately addressed, in the opinion of the wing.
Borderline Compliant (50-74%)	Means that 50%-74% of the issues in the question are adequately addressed, in the opinion of the wing.
Mostly Compliant (75-99%)	Means that 75%-99% of the issues in the question are adequately addressed, in the opinion of the wing.
Completely Compliant	Means that all of the issues in the question are adequately addressed, in the opinion of the wing.

Table 19. Compliance with Air Force SWAPI Requirements Matrix.

N/A - Not Applicable		PROGRAM NAME (insert Program Name)				
Red - Poorly Compliant (< 50%)						
Yellow - Borderline Compliant (50 - 74%)						
Blue - Completely Compliant						
Wing Process Area	Section #	Question	Answer	Stoplight Color	Evaluator	Color
People, Training, and Experience	Q1 3.3.1	Describe how the required experience level is determined, how the training level of the wing personnel is being tracked, and how these personnel are being trained (also identify where no training is being provided).	The required experience level is determined ..., the training level of the wing is being tracked ... the program personnel are being trained ...	Y		
	Q2 3.3.1	Describe the wing's plan for retaining key staff, training new staff members, and performing cross training. Describe the current software staff leadership in the wing and on the program.	The wing's plan for "retaining" key personnel is ... the training of new staff members is ... and cross-training is ...	G		
	Q3 3.3.1	Describe how it is determined that the staff personnel have the material resources to accomplish their job (i.e., computers, copiers, Internet Access, reliable email, development and test tools, network support such as ftp, SecureID, Kerbos, support, etc.).	The wing/program office ensures the staff personnel have the ...	R		
Policy and Guidance	Q1 3.3.2	Describe how the wing addresses software policy as an integral part of systems engineering, and applies all tenets of systems engineering to software.				
	Q2 3.3.2	Describe how the wing addresses software management and acquisition guidance, including:				
		The source of software acquisition and management guidance and recommended practices.				
		How the wing consolidates this guidance and practices and tailors it for the various wing components.				
	References to any examples and templates the wing uses to ease application of guidance and practices.					

DAVID E. SWANSON, Colonel, USAF
 Director, Engineering and Architectures

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

Revitalizing the Software Aspects of Systems Engineering, dated 20 Sept 04 (SAF/AQ)
Policy on Software Acquisition at SMC, 20 August 2004 (SMC/CC)
Office of the Secretary of Defense Memorandum on Software Acquisition Process Improvement Programs, dated 21 Mar 2003 (OSD AT&L/C3¹)
Public Law 107-314, Section 804 (Bob Stump National Defense Authorization Act for Fiscal Year 2003)
Capability Maturity Model[®] Integration[®], Current Version
SMC Software Acquisition Handbook, Current Version
DoDI 5000.02, dated 12 May 2003, current version
SMCI 63-104, Software Acquisition Instruction, current version

Abbreviations and Acronyms

ABG—Air Base Group
ACE—Acquisition Center of Excellence
AT&L—Acquisition, Technology and Logistics
AFMC—Air Force Materiel Command
AFMC/ASC—Air Force Materiel Command/Aeronautical System Center
AFMC/ESC—Air Force Materiel Command/Electronic Systems Center
AFOTEC—Air Force Operational Test and Evaluation Center
AFSPC—Air Force Space Command
AFSSG—Air Force Software Steering Group
AFSSIP—Air Force Software Intensive Systems Strategic Improvement Program
C³I—Command, Control, Communications and Intelligence
CDRL—Contracts Data Requirements List
CMM[®]—Capability Maturity Model[®]
CMMI[®]—Capability Maturity Model[®] Integration[®]
CMMI[®]-ACQ—Capability Maturity Model[®] Integration[®] - Acquisition Model
COTS—Commercial Off The Shelf
DID—Data Item Description
DoD—Department of Defense
EA—Engineering and Architecture Division
EAS—Engineering and Architecture Software
MGMT—Management
NDAA—National Defense Authorization Act
OSD—Office of the Secretary of Defense

PDF—Portable Document Format
PEO—Program Executive Officer
PGM—Program
PMR—Program Management Review
PO—Program Office
POC—Point of Contact
RFP—Request For Proposal
SAF/AQ—Secretary of the Air Force/Acquisition
SAF/IA—Secretary of the Air Force/International Affairs
SAF/US—Secretary of the Air Force/Under Secretary
SEI—Software Engineering Institute
SETA—System Engineering and Technical Assistance
SMC—Space and Missile Systems Center
SOO/SOW—Statement of Objectives/Statement of Work
SPO—Systems Program Office
SSG—Software Steering Group
STSC—Software Technology Support Center-Software
SWAMP—Software Acquisition Management Plant
SWAPI—Software Acquisition Improvement

Attachment 2

SUGGESTED QUESTION/ANSWER TEMPLATE¹

A2.1. Suggested Question/Answer Template.

Table A2.1. Suggested Question/Answer Template¹.

N/A - Not Applicable		PROGRAM NAME (insert Program Name)				
Red - Poorly Compliant (< 50%)						
Yellow - Borderline Compliant (50 - 74%)						
Blue - Completely Compliant						
Wing Process Area	Section #	Question	Answer	Stoplight Color	Evaluator	Color
People, Training, and Experience	Q1 3.3.1	Describe how the required experience level is determined, how the training level of the wing personnel is being tracked, and how these personnel are being trained (also identify where no training is being provided).				
	Q2 3.3.1	Describe the wing's plan for <u>retaining</u> key staff, training new staff members, and performing cross training. Describe the current software staff leadership in the wing and on the program.				
	Q3 3.3.1	Describe how it is determined that the staff personnel have the material resources to accomplish their job (i.e., computers, copiers, Internet Access, reliable email, development and test tools, network support such as ftp, SecureID, Kerbos, support, etc.).				
Policy and Guidance	Q1 3.3.2	Describe how the wing addresses software policy as an integral part of systems engineering, and applies all tenets of systems engineering to software.				
	Q2 3.3.2	Describe how the wing addresses software management and acquisition guidance, including:				
		The source of software acquisition and management guidance and recommended practices.				

¹ The format of this template is flexible. The content is required.

		How the wing consolidates this guidance and practices and tailors it for the various wing components.				
		References to any examples and templates the wing uses to ease application of guidance and practices.				
	Q3 3.3.2	Describe how the wing addresses the following topics:				
		Budget and schedule estimates (80%-90% confidence)				
		Application of lessons learned with respect to software size growth				
		Participation of application domain experts in program estimates				
		Adjusting budget and schedule when requirements change				
		Robust risk management program				
		Requirements and expectation management process involving wing, user, and prime contractor personnel				
		Studying lessons learned from previous programs before planning and during execution				
		Incentives and/or award fee				
	Q4 3.3.2	Describe how the wing tracks compliance to ensure they are adhering to the mandatory provisions of laws, policies, regulations, etc.				
Q5 3.3.2	Describe how the wing is in compliance with the Clinger-Cohen Act (CCA)					
SW Tech Development and Transition	Q1 3.3.3	Describe how the wing verifies the contractor has a process for assessing the feasibility of meeting system performance requirements.				
	Q2 3.3.3	Describe how the wing personnel have addressed maintainability and supportability issues (e.g., Contractor Logistic Support, access to design documentation). Sustainment includes: maintenance, transportation, sustaining engineering, data management, configuration management, manpower, personnel, skills, training, critical program information protection, anti-tamper provisions, information technology and technology refresh.				
	Q3 3.3.3	Describe how wing personnel assure the system will have sufficient spare resources for future expansion (e.g., using only 50% of available memory, 50% of performance timing available)				

	Q4 3.3.3	Describe how wing personnel are assigned to verify the system being acquired from the contractor(s) has taken human interface/usability into account.				
Special Interest Items	Q1 3.3.4	Describe for each item how the wing has established (determined and provided): (1) guidance; (2) tailorable templates or examples; (3) training; and (4) made them easily accessed (made available) for use: Commercial Items, GOTS; open source software, software from foreign sources, reuse application and impacts, system architecture, and information assurance. Although all special interest items must be addressed, be sure to fully address these two special items: software from foreign sources and information assurance.				
		Commercial Items				
		GOTS				
		open source software				
		software from foreign sources				
		reuse application and impacts				
		system architecture				
	information assurance					
	Q2 3.3.4	Describe how the wing verifies the risks associated with reuse, Commercial Items, GOTS, and open source software, and information assurance. Describe how the wing <u>verifies that foreign-developed software is identified and understood</u> , and how the risks are mitigated.				
Q3 3.3.4	Describe how the wing verifies the system supports the architecture and network-centric paradigm to include analysis and implementation trade-offs.					
Q4 3.3.4	Describe how the wing ensures that emphasis has been placed on software testing areas such as: early software testing, test planning, test strategy, test plans, test bed development, test procedures, test scenarios, test cases and metrics.					
Q5 3.3.4	Describe how the wing verifies the contractor utilizes types of testing that will adequately test the system software. Types of testing include: white box, black box, stress, positive/negative, boundary and system.					
Acquisition Processes and Compliance	Q1 3.3.5	Describe how the wing has incorporated software into its program acquisition strategy (including software development, test, and support strategies) and RFP(s) (including SOW and SOO, standards and other compliance documents, CDRL items and associated DIDs, award and incentive fees,				

		and evaluation criteria).				
	Q2 3.3.5	Describe the processes the wing is using for software acquisition as an integral part of the system acquisition, including processes for software acquisition planning, requirements development and management, risk management, configuration management, solicitation and source selection, contract monitoring, and test and evaluation. Please provide a reference to the Software Acquisition Management Plan (SWAMP) that the program is using to manage the acquisition throughout the life cycle.				
	Q3 3.3.5	Describe the techniques the wing is using to develop an independent program software size, cost, and schedule estimate and to evaluate the contractors' estimates of size, cost and schedule for realism.				
Developer Process Compliance	Describe how the wing establishes guidance and methods for evaluating contractor capability, capacity, and commitment to disciplined development processes in source selection to include: Requiring the IMP, System Engineering Management Plan, and Software Development Plan as:					
	Q1 3.3.6	Part of the proposal, evaluating them during source selection, and making them contractually binding.				
		Identifying and addressing strengths, weaknesses, and risks.				
		Evaluating the contractor teams' software capabilities, both for source selection and contract monitoring (e.g., use of CMMI [®] , other techniques).				
	Q2 3.3.6	Describe how the wing ensures all development contractors have defined, documented, applied, and enforced disciplined processes.				
Q3 3.3.6	Describe how the wing establishes the capability to support periodic independent assessments of developer capability and capacity, based on PEO/program manager demand.					

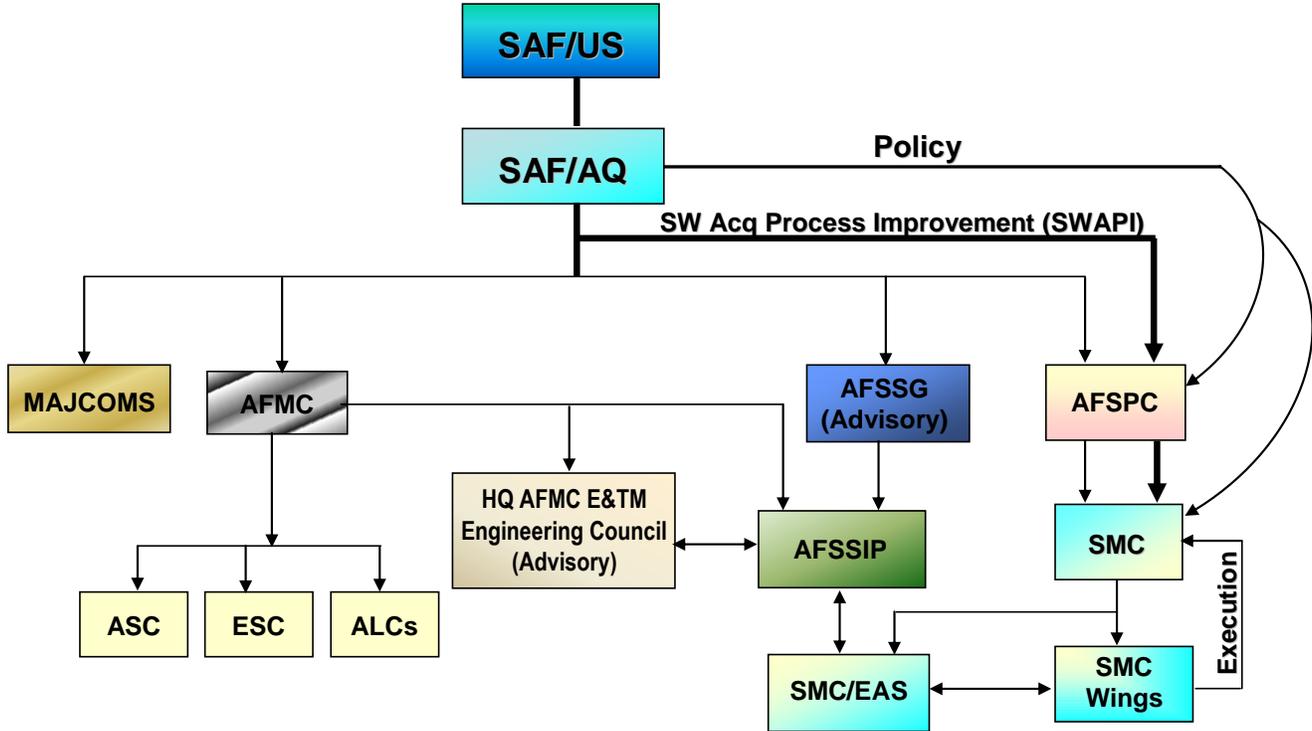
	Q4 3.3.6	Describe how the wing tracks whether the wing and the contractor team(s) execute within cost, schedule, and performance baselines and how corrections are made (including configuration management).				
Metrics, Assessment, and Improvement	Q1 3.3.7	Describe how the wing uses the results from independent program assessments prior to key system milestones:				
		as a preventive measure				
		to identify strengths, weaknesses, and risks relevant to the phase of the program				
	Q2 3.3.7	Describe how the wing defines and publishes expectations for acquisition process improvement to focus on improving the team's ability to rapidly deliver war-fighting capability.				
	Q3 3.3.7	Describe the software-intensive system acquisition-related metrics the wing uses. Include both: (a) metrics used within the program(s) to assess the acquisition processes, as well as (b) metrics used to measure the contractor's software development activities. Include metrics related to acquisition process compliance, software progress (design, coding, and testing), software development effort, staffing profiles, cost, schedule, software size, risk management, computer resource utilization, requirements volatility and management, testing, defects, quality, development team capability, and complexity.				
	Q4 3.3.7	Describe how the wing sets metric objectives and thresholds and how the wing uses the metrics (including objectives, thresholds, plans, actuals, and historical data) to manage the acquisition, development, and, if applicable, sustainment, and describe how the metrics are used to influence program decisions.				
Q5 3.3.7	Describe how the wing determines and uses the software cost/schedule earned value (e.g., schedule performance index and cost performance index at the software level).					

Attachment 3

HEADQUARTERS AIR FORCE (HQ AF) OVERSIGHT

A3.1. Headquarters Air Force (HQ AF) Oversight.

Figure A3.1. Headquarters Air Force (HQ AF) Oversight.



Attachment 4

METRIC PROCESS FLOW DIAGRAM

A4.1. Metric Process Flow Diagram.

Figure A4.1. Metric Process Flow Diagram.

