ETOPS and SMS: GAP Comparison

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ETOPS and SMS GAP

FAA Aircraft Certification has tasked the Center for General Aviation Research (CGAR)

to contrast the content of certain ETOPS documents with the Design and Manufacturing (D&M)

SMS framework, Revision C. Excel Attachment 1 to this document contains this comparison.

The comparison uses the June 5, 2012, *D&M SMS FRAMEWORK: D&M Safety*

Management System (SMS) Framework, Revision C for the DMSMS standard. The ETOPS

source documents provided were:

1. AC 120-42B, *Extended Operations (ETOPS and Polar Operations)*;
2. AC 25.1535-1X, *Certification of Transport Category Airplanes for Extended Operations (ETOPS);*
3. AC 33.201-1, *Extended Operations (ETOPS) Eligibility for Turbine Engines;*
4. FAA Order 8900.1 CHG 119, Volume 4, Chapter 6, *Aircraft Equipment and Operational Authorizations, Airplane Authorizations And Limitations;*
5. Special Conditions, Federal Register, June 1, 1994, *Extended Range Operation of Boeing Model 777 Series Airplanes*;
6. Special Conditions, , Federal Register, October 20, 2003, *Extended Range Operation of Boeing Model 777 Series Airplanes*;
7. NPRM Federal Register, November 14, 2003, *Extended Operations (ETOPS) of Multiengine Airplanes;*
8. NPRM Federal Register, June 16, 2007, *Extended Operations (ETOPS) of Multiengine Airplanes;*
9. MMEL Policy Letter 40, Revision 2, December 3, 2009, *ETOPS and Polar Operations*.

Of the documents provided, only documents 1 - 4 were used for this GAP analysis. Documents

5 - 8 were reviewed and considered to be historical elaborations of documents 1 - 4. Document 9

was not used as it was a prescriptive document addressing details of minimum equipment list

considerations, rather than broader policy.

The following columns exist in Attachment 1:

- **(A) Full Node Outline Path**. This is the hierarchal path to the SMS framework

   node being compared. There will always be an entry in this column.

- **(F) Simple Node**. A textual abbreviation of the DMSMS framework node, with leading dashes to represent the indentation level of the node. When the node of the hierarchy in DMSMS Revision C was removed as "directional guidance," the code "$DG" is used; when the node was removed as a duplicate, the code "$Removed, duplicate" is used.

- **(H) Node Status**. Either "OK," "REMOVED," or "DG," indicating the status of the DMSMS framework node.

- **(J-L) AC 120-42B GAP**. The GAP includes:

    - **(J) GAP Rating**. A numerical code indicating the amount of overlap between DMSMS and this ETOPS document;

    - **(K) Sections**. A semi-colon delimited list of sections that were found in the ETOPS document to overlap with the DMSMS framework; and

    - **(L) Notes**. Elaborations on the reason the GAP rating score was assigned.

- **(N-P) AC 25.1535-1X GAP**. The GAP includes:

    - **(N) GAP Rating**. A numerical code indicating the amount of overlap between DMSMS and this ETOPS document;

    - **(O) Sections**. A semi-colon delimited list of sections that were found in the ETOPS document to overlap with the DMSMS framework; and

    - **(P) Notes**. Elaborations on the reason the GAP rating score was assigned.

- **(R-T) AC 33.201-1**. The GAP includes:

    - **(R) GAP Rating**. A numerical code indicating the amount of overlap between DMSMS and this ETOPS document;

- o **(S) Sections**. A semi-colon delimited list of sections that were found in the ETOPS document to overlap with the DMSMS framework; and

- o **(T) Notes**. Elaborations on the reason the GAP rating score was assigned.

- **(V-X) FAA Order 8900.1, Volume 4, Chapter 6**. The GAP includes:

  - o **(V) GAP Rating**. A numerical code indicating the amount of overlap between DMSMS and this ETOPS document;

  - o **(W) Sections**. A semi-colon delimited list of sections that were found in the ETOPS document to overlap with the DMSMS framework; and

  - o **(X) Notes**. Elaborations on the reason the GAP rating score was assigned.

The spreadsheet is color coded for readability. Also, there are some hidden columns which contain raw data used to build the final, unhidden columns.

The comparison was accomplished using the qualitative software package, NVivo, Version 10. First, the node structure of the DMSMS Framework was imported into NVivo's node structure. Each ETOPS document was then reviewed and coded against the DMSMS node structure. If one node of the ETOPS document being reviewed was applied to more than one node in the DMSMS framework, then it was coded multiple times. Upon completion of the coding process, an NVivo matrix query was run to summarize the coding counts of each ETOPS document versus the DMSMS framework. Wherever no coding existed in the matrix query (i.e., a count of 0), a GAP rating of "5" was assigned. The textual content of each non-zero count in the matrix query was then reviewed, and the rubric in Table 1 was applied to determine a GAP rating along with notes explaining the rationale for the rating.

The inverse process—examining each item in each ETOPS document node structure and then searching the DMSMS standard—was not accomplished.

Discussion

The process of comparing SMS and ETOPS intends to represent an objective contrast of the two frameworks, however, limitations of the approach inevitably introduce subjectivity. A group environment, involving three to five subject matter experts in SMS and ETOPS would help advance the present document to a more objective state.

Conclusions

A review of the coding of the ETOPS document coding reveals about 5 - 25% of each ETOPS document accounted for the DMSMS nodal references. Specifically,

- 19.7% of AC 120-42B overlapped with the DMSMS node structure (that is, 80.3% of AC 120-42B had no relevance to the DMSMS node structure);

- 5.6% of AC 25.1535-1X overlapped with the DMSMS node structure (that is, 94.4% of AC 25.1535-1X had no relevance to the DMSMS node structure);

- 25.6% of AC 33.201-1 overlapped with the DMSMS node structure (that is, 74.4% of AC 33.201-1 had no relevance to the DMSMS node structure);

- 28.5% of FAA Order 8900.1 Volume 4 Chapter 6 overlapped with the DMSMS node structure (that is, 71.5% of FAA Order 8900.1 Volume 4 Chapter 6 had no relevance to the DMSMS node structure).

Further, many parts of the ETOPS documents were coded to multiple nodes; on average, one given section of an ETOPS document mapped to two to three different nodes in the DMSMS framework. For example, in AC 25.1535-1X, Section 9(b)(1) mapped to four different DMSMS framework nodes.

A review of Attachment 1 suggests ETOPS has significant gaps compared to the DMSMS Component 1, Safety Policy. Much of this stems from a lack of reference to an

accountable executive. The next most significant gap is the DMSMS Component 4, Safety

Promotion. As one may expect, the best overlap occurred in the area of DMSMS Components 2

and 3, Safety Risk Management (SRM) and Safety Assurance (SA), respectively; however, SRM

and SA still evidenced significant gaps.

Importantly, though, it can be concluded that many SMS principles are evident in the

ETOPS documents examined.

Table 1

Rubric Describing Rating Scale

Rating	Rating Scale	Description
5	− − − − − | − − − − 5	ETOPS has large omissions in both scope of safety and scale compared to SMS. While ETOPS may mention the area covered by SMS, it is nearly an empty comparison or complete gap.
4	− − − − − | − − − 4 −	ETOPS is lacking both in scope of safety and scale compared to SMS.
3	− − − − − | − − 3 − −	SMS and ETOPS have equivalent scope of safety concepts. SMS scale exceeds that of ETOPS.
2	− − − − − | − 2 − − −	SMS and ETOPS have equivalent scale of concepts. SMS scope exceeds that of ETOPS in the area of safety or as otherwise stipulated in comparison comments.
1	− − − − − | 1 − − − −	SMS and ETOPS safety scope and scale identical; SMS linguistic expression requires ETOPS linguistic adjustment.
0	− − − − − 0 − − − − −	SMS and ETOPS equivalent both in safety scope and scale.

Note: Ratings -1 through -5 are not yet defined; these values would show where ETOPS exceeds SMS.