

SOO TAP RECOMMENDATIONS FOR COMAP

Final Revision– 01 June 2004

Introduction

The COMET Mesoscale Analysis and Prediction course (COMAP) was initiated in 1991 to give NWS Science and Operations Officers (SOOs) the background to conduct on-station scientific research and training. Providing an in-depth review of mesoscale meteorology, the course goals for each participant are the following:

1. Increase knowledge of mesoscale meteorology
2. Enhance knowledge of the capabilities, limitations and applications of new observing systems, and mesoscale modeling systems
3. Improve skills in forecasting mesoscale weather phenomena
4. Enhance ability to lead on-station-training programs
5. Prepare to fully utilize COMET distance learning materials
6. Improve understanding of the applied research/forecasting techniques development methodology

Taught at the graduate level, the course includes case studies to illustrate mesoscale phenomena, displaced real-time (DRT) cases to simulate the forecasting environment, seminars by visiting scientists, discussions of new observing systems, and supervised interactions with local Boulder scientists on independent research projects.

SOO TAP Assessment

The SOO Training Advisory Panel (SOO TAP) was established in January 2004 to evaluate the current structure and content of the COMAP course and to provide recommendations for improvement. In drafting these recommendations, the SOO TAP considered the following:

1. Weekly student evaluations from the past two COMAP courses (FY 02 and FY04)
2. Surveys of COMAP eligible SOOs who chose not to attend the course (Appendix A)
3. Suggestions from previous COMAP co-lead instructors
4. Survey results from the COMAP FY02 and FY04 participants (Appendix B)
5. TAP members' experience
6. Original COMAP course plans with goals and curriculum

Overall, COMAP has matured since the inaugural course. Weekly course evaluations and reviews throughout the years have remained very positive. A comparison of an early course plan to the FY02 and FY04 COMAP curriculum indicates that much of the

structure of the original course is still intact despite the length being shortened from eight to six weeks.

Nonetheless, the role and demands of the SOO have evolved since the introduction of COMAP. Consequently, the SOO TAP has identified some weaknesses that should be addressed for COMAP to remain a highly successful COMET offering. Some of the outstanding issues that need to be resolved include the following:

- Limiting the SOO's ability to opt out while encouraging a positive attitude toward the course before attending
- The impression that the course is a loosely tied collection of presentations
- Not all topics are relevant to the SOOs or the NWS
- There is too much regional bias in some topics
- The course is not as efficiently organized as possible
- Some speakers and presentation materials need improvement
- The course length is too long to accommodate the personal and office needs of today's SOOs
- There is not enough material relating to human factors and "how to train"

Final SOO TAP Recommendations for COMAP

After assimilating all the available information, the SOO TAP has the following recommendations for the COMAP course:

I. To reorganize COMAP

The SOO TAP recommends that COMAP be reorganized to resemble an academic style curriculum wherein the COMAP experience exists as a 3-week core course (COMAP CORE) accompanied by various COMAP symposia. Each offering will be given a credit value corresponding to the number of weeks in the course. A SOO will successfully complete COMAP when the core course (3 credits) plus any combination of COMAP symposia greater than or equal to seven credits (3 credits for the core course plus 4 or more credits from symposia offerings) is achieved.

The purpose for this more academic style structure is to provide the SOOs flexibility to choose the type of training necessary to do his or her job, and to establish the foundation for a SOO college within the proposed NWS university framework. In addition, this change toward a shorter course format with more job relevant content should reduce or eliminate the number of SOOs opting out of the course.

Every new SOO will assume responsibility for completion of COMAP CORE as soon as possible upon accepting the position (Recommendation IX). SOOs will also be required to select from the available COMAP symposia to fulfill the 7-credit requirement for

completion of COMAP. The 7-credit requirement should be satisfied no later than 2 years following the completion of COMAP CORE.

II. Content of COMAP CORE

The SOO TAP recommends that the 3-week COMAP CORE be organized to focus on the needs of today's SOOs. While providing mesoscale meteorology training must remain the primary mission of COMAP, some non-meteorological topics should be considered for inclusion to enhance the overall educational experience. For example, previous participants responding to the surveys suggested that COMAP should include more information and guidance on being an effective SOO, the expectations of the SOO position, and developing and administering on-station training.

Thus, it is recommended that in addition to a core science curriculum, COMET consider the following topics for inclusion in COMAP CORE:

- NWS expectations of a SOO/SOO Job Aid (Appendix C)
- History of the SOO Program
- Available SOO science and training resources (e.g., COMET, MetEd, STRC, Training Resource Center, National Case Study Library, Outreach Program, Visit Program, WDTB, NSTEP)
- How to develop on-station training programs (including best practice presentations by current SOOs)
- How to effectively administer on-station training
- How to implement and conduct on-station research
- Motivational techniques
- How to implement and conduct an on-station forecast verification program
- Methods and levels of training evaluations
- Class field trips to NCAR, NOAA, FAA, and/or other facilities

The SOO TAP recognizes that some of the above subjects have not traditionally been taught during COMAP; however, survey responses strongly indicate new SOOs would greatly benefit from instruction in these areas. An alternative may be to present some of the above topics during a development course for new SOOs, but no such offering currently exists. The SOO TAP is considering the structure and curriculum of a SOO developmental course. However, until such a course is approved and established, COMAP remains the most effective way of delivering the recommended training.

III. Remove the COMAP Mentor Program from the Core Curriculum

The current COMAP course schedule includes the equivalent of one week dedicated to COMAP mentor program related research and presentations. Given the time constraints within the new COMAP structure and an expressed lack of interest by some previous participants, the SOO TAP recommends removing the Mentor Program from the core

curriculum. The additional classroom time may be used for more science-based education, effectively increasing the total amount of residence training.

The SOO TAP does recognize the potential value of the COMAP Mentor Program. Consequently, the panel recommends that the program be reestablished as a three credit “directed study” symposium. In assigning the high value of three credits, the SOO TAP acknowledges the effort involved in successfully completing of the course, as well as the potential benefits to both the participating SOO and NWS.

A SOO who wishes to participate in the Mentor Program would make a request to their regional SSD. The name of the prospective student and area of interest would be forwarded to COMET to be paired with a potential mentor in the research or academic community. The proposed area of study should be related to a locally relevant forecasting problem. The criteria for successful completion of the program will be determined before course enrollment, and be agreed upon by the student, regional SSD, a COMET representative, and the student mentor.

Finally, it is recommended that to ensure a successful SOO-Mentor collaboration, financial resources should be made available through the COMAP Outreach Program as either COOP Program or Partners Project grants.

IV. Suggestions for COMAP Symposia

SOOs will select from various symposia offerings to fulfill the COMAP requirements. Ideally, a SOO would choose offerings that address the needs of the WFO, so it is important that course content have a NWS operational focus. COMAP symposia should be open to anybody wishing to attend; however, the SOO TAP recommends that priority seating be given to those SOOs attempting to fulfill COMAP requirements, followed by previous COMAP graduates who wish to further their science training and education.

The SOO TAP suggests that the following course topics include:

- Numerical Weather Prediction Modeling
- Winter Weather Forecasting
- Severe Weather Forecasting
- Flash-Flood Forecasting
- Marine Meteorology
- Tropical Meteorology
- Mountain Meteorology
- Fire Weather Meteorology
- Boundary Layer Meteorology
- Mesoscale Observing Systems and Datasets
- Climate services
- Aviation Meteorology

The panel recognizes the COMAP symposia offerings will have to fit into allowable time and financial constraints. There will also likely be some overlap between the symposia curriculum and that of COMAP CORE.

V. Emphasize NWS Operations in Laboratory Exercises

In reviewing the course surveys, the panel found that many SOOs highly praised the laboratory exercises at COMAP, especially those labs that were relevant to their office operations. Consequently, the SOO TAP recommends that the COMAP CORE and symposia offerings include well-conceived and -developed laboratory exercises that are operationally relevant. Exercises should be built around case studies that utilize WES and other operationally-based software whenever possible.

VI. Weather Discussions should be Reduced or Eliminated

The SOO TAP recommends that rather than having daily forecast briefings, the allotted time should be used for alternative topic seminars and discussions. Include such topics as office and NWS policy, training, leadership, forecasting, and scientific issues, as well as panel discussions. Bring in an expert and/or facilitator to ensure these sessions are informative and inspire lively debate.

VII. Include Outside Classroom Activities that Promote Interactions and Bonding among SOOs

According to the participant surveys, one of the most valuable experiences of COMAP was the ability to develop relationships with other SOOs. As a result, the SOO TAP recommends that COMET encourage and facilitate more interaction among SOOs both during and outside of class-time. This recommendation may be achieved by arranging or suggesting optional evening and weekend group tours, trips, hikes, dinners, outings, etc. In addition, some class-time may be set aside for group activities such as field trips to FSL, NCAR, and CWSU. Monday evening receptions may be moved to an alternate location such as the hotel.

VIII. Improvement of COMAP Course Materials and Speakers

Many of the FY02 and FY04 COMAP participants noted a lack of quality control in the COMAP presentation materials and effectiveness of speakers. Also singled out was the inclusion of irrelevant topics with little or no NWS focus. A few of the speakers who received relatively poor reviews during FY02 were invited back in FY04, only to get poor reviews again.

The SOO TAP recommends that COMET take a more active role in ensuring that each presentation is of the best possible quality and relevance. This recommendation may require that COMET develop materials for some topics in COMAP; however, this step

would make it easier for class participants to absorb the information and ultimately reuse the material during office training. This should also improve the continuity of the content between courses. In addition, except for extenuating circumstances, all presentations should be given in person.

IX. Make COMAP a SOO job requirement

The SOO TAP recommends that COMAP should be mandatory for all new SOOs. It is also suggested that the COMAP requirement be included in the SOO job vacancy announcement.

X. Each Region should be Responsible for Sending SOOs

The SOO TAP recommends that each region identify an individual who is responsible for making the final decision as to whether exceptions to this rule may be made. The names of non-attendees along with the rationale should be made available to the Field Requirements Group.

XI. Make SOOs Accountable for Performance on Weekly Quizzes

The SOO TAP recommends that all COMAP courses have weekly quizzes with final grades made available to regional SSDs and office MICs. All course participants should be made aware that they will be tested on the class material and their supervisors will see the scores.

XII. Reintroduce Prerequisite Material

The SOO TAP recommends that some topics be made a prerequisite for COMAP courses. This required training should be in the form of COMET distance learning materials, VISIT sessions, or scientific journal articles. It should be up to the discretion of COMET as to what material would be completed by the SOO before attending COMAP CORE and what constitutes satisfactory completion. COMET must provide at least 6 months for the SOOs to complete the material.

The panel also recommends that the prerequisite material be included on the initial quiz of the course. There should not be any formal reprimand for not completing the training other than the potential of a lower quiz score. An additional penalty for not completing the requirements may be to hold an individual back from participating in class-time field trips to accomplish the tasks.

XIII. Revision of the COMAP Course Plan

The SOO TAP recommends that COMET develop a revised COMAP course plan incorporating the SOO TAP recommendations. This opportunity should also be used to establish the mesoscale meteorology curriculum for the course. The new plan should be drafted with the assistance of three current, long tenured (5+ years) SOOs and the NWS Training Division. It is suggested that COMET revisit the original COMAP course design and curriculum as presented in the early course plan to use as guidance.

The SOO TAP approved these recommendations on: 19 May 2004

Panel Members:

Andy Nash	WFO/HNL	
Brett McDonald	WFO/RIW	
Carven Scott	WFO/ANC	
David Bernhardt	WFO/TFX	
Jeffrey Craven	WFO/JAN	
John Eise	WFO/MKX	
Jon Zeitler	WFO/EWX	
Josh Korotky	WFO/PBZ	
Kenneth Labas	WFO/LOT	
Matthew Bunkers	WFO/UNR	
Stanley Czyzyk	WFO/VEF	
Peter Manousos	NCEP	
Robert Rozumalski (Leader)	FDTB	
Wendy Abshire	COMET	<i>Abstained</i>

Appendix A: Summary from Interviews with non-attending SOOs

Reponses for not attending COMAP04

86%	6 of 7	Staffing issues/requirement to work shifts
57%	4 of 7	Family/Personal
29%	2 of 7	Did not feel it was worth it
29%	2 of 7	Committed to attending conferences
29%	2 of 7	Busy with other job-related duties

Analysis

1. **Staffing issues/requirement to work shifts** is clearly a problem, *likely due to the commitment of 6 of 7 consecutive weeks.*
2. 2 of 7 responses in **Family/Personal**, 2 of 7 **Committed to attending conferences**, and 1 of 7 **Busy with other job related issues** *indicate the course was planned at an inopportune time, or information was not provided to students early enough.*
3. 2 of 7 **Did not feel it was worth it** and 1 of 7 **Busy with other job related issues** *indicate the course does not appeal or is not relevant for some SOOs.*

Suggested Conclusions

1. Based on Analyses 1 and 2, *maintenance of COMAP with a 6 of 7 week or similar schedule is impractical*. Regardless of how the course might be split up into smaller segments, *the NWS Training Division and COMET must ensure courses are not planned when students may have other commitments (i.e. AMS/NWA Annual Meetings), and that students receive planning information far in advance of the course (e.g. 3 months).*
2. At least 2, possibly 3, of these SOOs didn't feel COMAP would be valuable enough to attend. One response indicates *whether COMAP is applicable to the duties and responsibilities of NCEP Center SOOs*. Other responses indicate *SOOs feel they need leadership and teaching training* more than advanced mesoscale meteorology. *These responses are too few to provide a definitive recommendation*, but the notion of *whether any six-week course can meet the needs of such a diverse group is questionable*. This needs to be examined with the COMAP02/03 survey responses.

Appendix B - Summary of Survey Results from FY04 and FY02 COMAP Participants
COMAP04 Non-SOO TAP Student Survey (1=Totally Disagree to 5=Totally Agree)

Range	Mode	Average	Question
2 to 5	4	3.9	1a. Did COMAP increase your knowledge of mesoscale meteorology?
2 to 4	4	3.4	2a. Did COMAP enhance your knowledge of the capabilities, limitations, and applications of new observing and mesoscale modeling systems?
1 to 5	3,4,5	3.6	3a. Did COMAP improve your skills in forecasting mesoscale weather phenomena?
2 to 5	4	3.4	4a. Did COMAP enhance your ability to lead on-station training programs?
2 to 5	3	3.4	5a. Did COMAP prepare you to fully utilize COMET distance learning materials?
1 to 5	3,4,5	3.6	6a. Did COMAP improve your understanding of the applied research forecasting techniques development methodology?



COMAP02 Student Survey (1=Totally Disagree to 5=Totally Agree)

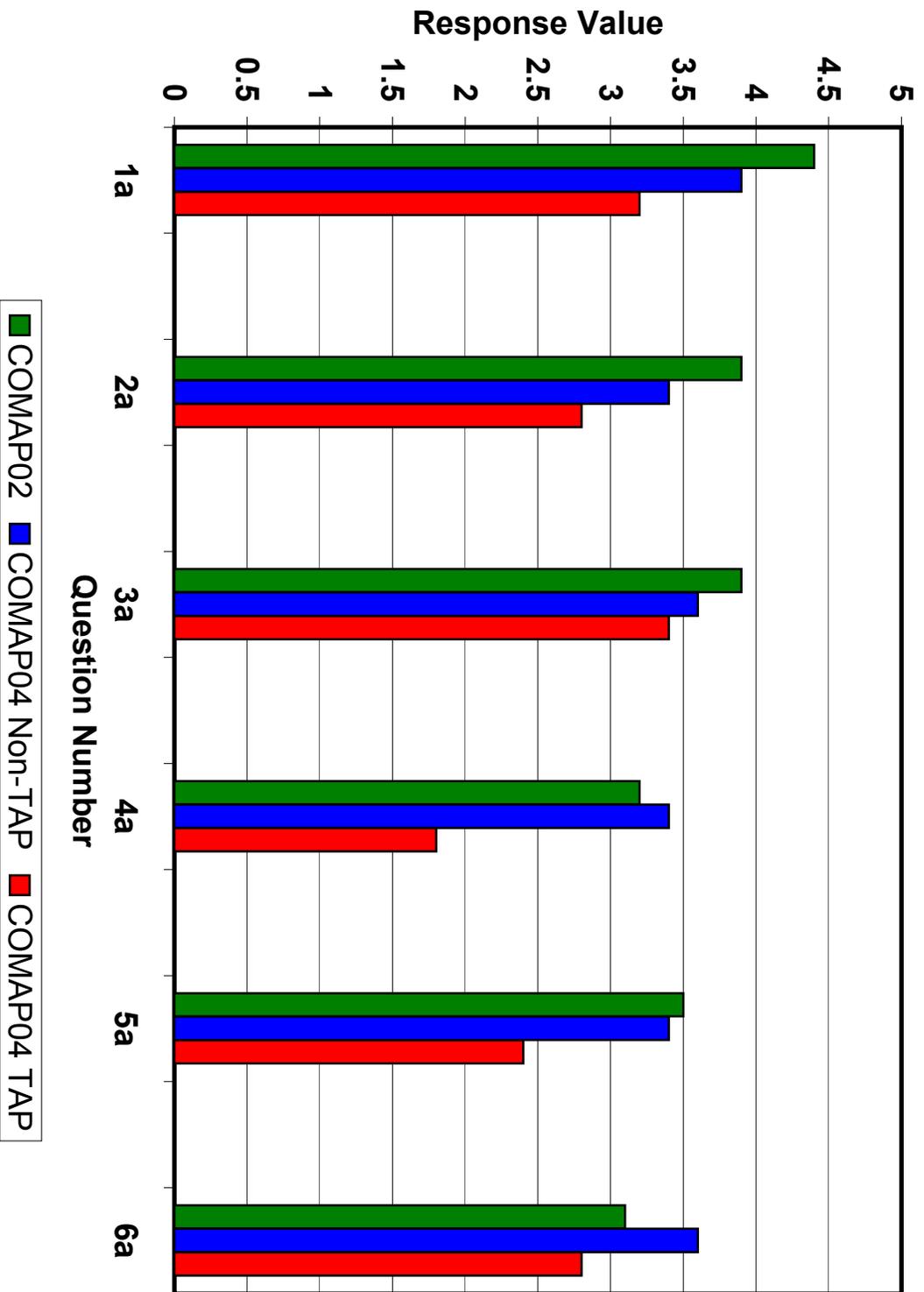
Range	Mode	Average	Question
3 to 5	4 and 5	4.4	1a. Did COMAP increase your knowledge of mesoscale meteorology?
2 to 5	4	3.9	2a. Did COMAP enhance your knowledge of the capabilities, limitations, and applications of new observing and mesoscale modeling systems?
2 to 5	4	3.9	3a. Did COMAP improve your skills in forecasting mesoscale weather phenomena?
1 to 5	4	3.2	4a. Did COMAP enhance your ability to lead on-station training programs?
2 to 5	3	3.5	5a. Did COMAP prepare you to fully utilize COMET distance learning materials?
1 to 4	3 and 4	3.1	6a. Did COMAP improve your understanding of the applied research forecasting techniques development methodology?

COMAP04 SOO TAP Student Survey (1=Totally Disagree to 5=Totally Agree)

Range	Mode	Average	Question
2 to 4	3 and 4	3.2	1a. Did COMAP increase your knowledge of mesoscale meteorology?
2 to 4	2	2.8	2a. Did COMAP enhance your knowledge of the capabilities, limitations, and applications of new observing and mesoscale modeling systems?
2 to 5	2 and 5	3.4	3a. Did COMAP improve your skills in forecasting mesoscale weather phenomena?
1 to 3	1 and 2	1.8	4a. Did COMAP enhance your ability to lead on-station training programs?
1 to 4	1 and 3	2.4	5a. Did COMAP prepare you to fully utilize COMET distance learning materials?
1 to 4	4	2.8	6a. Did COMAP improve your understanding of the applied research forecasting techniques development methodology?

Question	COMAP02	COMAP04 Non-SOO TAP	COMAP04 SOO TAP
1a□	4.4□	3.9	3.2
2a□	3.9□	3.4	2.8
3a□	3.9□	3.6	3.4
4a□	3.2□	3.4	1.8
5a□	3.5□	3.4	2.4
6a□	3.1□	3.6	2.8

SOOTAP Survey Responses



Overall impression questions and COMAP02 responses.

7. (13) What did you take away from COMAP that you feel improved your ability to do your job as SOO?

Gained Knowledge	9
Established Relationships with SOOs/Researchers/Instructors	6

8. (14) What specifically would you NOT want to change about COMAP?

Research Project	1
Social Activities	1
Quizzes, although not taxing	1
Interaction with Speakers/Researchers	3
The mix of lecture and lab	2
Using operationally-oriented instructors	1
The residence portion -- no teletraining	1
The length -- do not shorten	2
Winter and severe weather coverage	1
Mesoscale model lab	1
SPC representation	1

9. (15) What were your greatest disappointments about COMAP?

No disappointments	3
Too much repetition	1
Lack of quality control on presentations (some poor speakers)	1
Focus on too many subjects	1
Lack of in-depth discussion on some topics	1
Nothing on how to be a SOO (training, leadership, etc.)	4
Not enough information on how to do applied research	1
The research project	1
Not enough information on how numerical models work	1

10. (16) Describe any changes you would make to the course if you were given the opportunity?

Nothing	2
More on leadership/teaching/research "How to be a SOO"	5
Fewer speakers	1
More time on model ensemble basics	1
More on tropical/marine meteorology	1
Set up mentor program far in advance (≥ 3 months)	1
Have speakers/researchers available for discussion	1
More experienced SOOs as co-leads	1

11. Overall (17), were you happy with your experience at COMAP?

Why or why not?

Very Happy	4
Happy	7
Opportunity for interaction with SOOs/researchers/etc.	4
Nice physical environment (Boulder)	2
Operationally-oriented presenters	1
Finding out what is important for others in other locations	1
IT Staff	1

Overall impression questions and COMAP04 Non-SOO TAP responses.

7. (13) What did you take away from COMAP that you feel improved your ability to do your job as SOO?

Gained Knowledge	4
Established Relationships with SOOs/Researchers/Instructors	2
Performance on Quizzes	1
Everything	1
Independence to form local training program	1

8. (14) What specifically would you NOT want to change about COMAP?

Research Project	2
Social Activities	
Quizzes, although not taxing	
Interaction with Speakers/Researchers	2
The mix of lecture and lab	
Using operationally-oriented instructors	
The residence portion -- no teletraining	3
The length -- do not shorten	1
Winter and severe weather coverage	
Mesoscale model lab	
SPC representation	
Learning about phenomena/issues in other areas	1
Daily weather briefings	1
Interaction with other SOOs	1
Physical location (COMET/Boulder?)	1

9. (15) What were your greatest disappointments about COMAP?

No disappointments	2
Too much repetition	
Lack of quality control on presentations (some poor speakers)	2
Focus on too many subjects	
Lack of in-depth discussion on some topics	
Nothing on how to be a SOO (training, leadership, etc.)	
Not enough information on how to do applied research	
The research project	
Not enough information on how numerical models work	
Lack of diversity -- too much focus on a few topics	1
Length of course (too long)	1
Bad mentor experience	1
Too much emphasis on cold season/mountain meteorology	1
Not enough emphasis on severe/tropical/modeling	1
Video conferencing	1
Not held accountable for the quizzes	1

Political posturing by some presenters 1

10. (16) Describe any changes you would make to the course if you were given the opportunity?

Nothing
More on leadership/teaching/research "How to be a SOO" 3
Fewer speakers
More time on model ensemble basics
More on tropical/marine meteorology
Set up mentor program far in advance (≥ 3 months)
Have speakers/researchers available for discussion
More experienced SOOs as co-leads
Break up the course into smaller sessions 2
Portions which SOOs attend (presumes smaller/focused classes) 4
Shorten the course 1
Offer refresher courses for established SOOs 2
More field trips 1
Less lecture -- more lab 1
Instead of paper, distribute a DVD with course materials 1
Make the exams count 1
More classroom breaks 1

11. Overall (17), were you happy with your experience at COMAP?

Why or why not?

Very Happy 4
Happy 1
Opportunity for interaction with SOOs/researchers/etc. 2
Nice physical environment (COMET/Boulder) 2
Operationally-oriented presenters
Finding out what is important for others in other locations
IT Staff
No (disappointed) 2
Bad mentor experience 1
Didn't bond with class 1
COMET Staff 1
Excellent instructors 1
Haphazardly organized 1

Overall impression questions and COMAP04 Non-SOO TAP responses.

7. (13) What did you take away from COMAP that you feel improved your ability to do your job as SOO?

Gained Knowledge	3
Established Relationships with SOOs/Researchers/Instructors	4
Performance on Quizzes	
Everything	
Independence to form local training program	
How to organize and conduct training -- opposite of COMAP	1
Local modeling	1

8. (14) What specifically would you NOT want to change about COMAP?

Research Project	
Social Activities	
Quizzes, although not taxing	
Interaction with Speakers/Researchers	3
The mix of lecture and lab	
Using operationally-oriented instructors	
The residence portion -- no teletraining	2
The length -- do not shorten	
Winter and severe weather coverage	
Mesoscale model lab	
SPC representation	
Learning about phenomena/issues in other areas	
Daily weather briefings	
Interaction with other SOOs	1
Physical location (COMET/Boulder?)	
Labs	2
COMET Support Staff	2
Mentor program	1

9. (15) What were your greatest disappointments about COMAP?

No disappointments	
Too much repetition	1
Lack of quality control on presentations (some poor speakers)	3
Focus on too many subjects	
Lack of in-depth discussion on some topics	3
Nothing on how to be a SOO (training, leadership, etc.)	2
Not enough information on how to do applied research	
The research project	
Not enough information on how numerical models work	
Lack of diversity -- too much focus on a few topics	
Length of course (too long)	

Bad mentor experience	2
Too much emphasis on cold season/mountain meteorology	
Not enough emphasis on severe/tropical/modeling	
Video teleconferencing	2
Not held accountable for the quizzes	
Political posturing by some presenters	
Presentation of irrelevant topics	3
Not being able to return to the WFO as a "better SOO"	1
How to use the WES in training	1
Nothing on mesoanalysis	1
Course management (poor scheduling, remaining on schedule)	1
Panel discussion	1
Lack/lateness of logistical information for the course	1
Lack of consideration for students in planning the course	1
Lack of course focus -- what is COMAP trying to teach?	1
Lack of field trips to GACC/CWSU/etc.	1
Lack of interaction with speakers	2

10. (16) Describe any changes you would make to the course if you were given the opportunity?

Nothing	
More on leadership/teaching/research "How to be a SOO"	2
Fewer speakers	
More time on model ensemble basics	
More on tropical/marine meteorology	
Set up mentor program far in advance (≥ 3 months)	2
Have speakers/researchers available for discussion	2
More experienced SOOs as co-leads	
Break up the course into smaller sessions	3
Portions which SOOs attend (presumes smaller/focused classes)	2
Shorten the course	3
Offer refresher courses for established SOOs	1
More field trips	1
Less lecture -- more lab	
Instead of paper, distribute a DVD with course materials	
Make the exams count	
More classroom breaks	1
Add an experienced SOO/new SOO mentoring program	1
Drop the mentor program	1
Course leads should preview speakers for quality	2
End weather briefings	1
Enhance the mentor program	1

11. Overall (17), were you happy with your experience at COMAP?

Why or why not?

Very Happy	
Happy	4
Opportunity for interaction with SOOs/researchers/etc.	3
Nice physical environment (COMET/Boulder)	
Operationally-oriented presenters	
Finding out what is important for others in other locations	
IT Staff	
No (disappointed)	1
Bad mentor experience	
Didn't bond with class	
COMET Staff	
Excellent instructors	1
Haphazardly organized	
Glaring omissions of material	1
Course too long, too unfocused	1
Course should be like an Executive MBA program	1

Overall impression questions and COMAP02, COMAP04 Non-SOO TAP, and COMAP04 SOO TAP responses.

7. (13) What did you take away from COMAP that you feel improved your ability to do your job as SOO?

Gained Knowledge	16
Established Relationships with SOOs/Researchers/Instructors	12
Performance on Quizzes	1
Everything	1
Independence to form local training program	1
How to organize and conduct training -- opposite of COMAP	1
Local modeling	1

8. (14) What specifically would you NOT want to change about COMAP?

Research Project	3
Social Activities	1
Quizzes, although not taxing	1
Interaction with Speakers/Researchers	8
The mix of lecture and lab	2
Using operationally-oriented instructors	1
The residence portion -- no teletraining	6
The length -- do not shorten	3
Winter and severe weather coverage	1
Mesoscale model lab	1
SPC representation	1
Learning about phenomena/issues in other areas	1
Daily weather briefings	1
Interaction with other SOOs	2
Physical location (COMET/Boulder?)	1
Labs	2
COMET Support Staff	2
Mentor program	1

9. (15) What were your greatest disappointments about COMAP?

No disappointments	5
Too much repetition	2
Lack of quality control on presentations (some poor speakers)	6
Focus on too many subjects	1
Lack of in-depth discussion on some topics	4
Nothing on how to be a SOO (training, leadership, etc.)	6
Not enough information on how to do applied research	1
The research project	1
Not enough information on how numerical models work	1
Lack of diversity -- too much focus on a few topics	1

Length of course (too long)	1
Bad mentor experience	3
Too much emphasis on cold season/mountain meteorology	1
Not enough emphasis on severe/tropical/modeling	1
Video teleconferencing	3
Not held accountable for the quizzes	1
Political posturing by some presenters	1
Presentation of irrelevant topics	3
Not being able to return to the WFO as a "better SOO"	1
How to use the WES in training	1
Nothing on mesoanalysis	1
Course management (poor scheduling, remaining on schedule)	1
Panel discussion	1
Lack/lateness of logistical information for the course	1
Lack of consideration for students in planning the course	1
Lack of course focus -- what is COMAP trying to teach?	1
Lack of field trips to GACC/CWSU/etc.	1
Lack of interaction with speakers	2

10. (16) Describe any changes you would make to the course if you were given the opportunity?

Nothing	2
More on leadership/teaching/research "How to be a SOO"	10
Fewer speakers	1
More time on model ensemble basics	1
More on tropical/marine meteorology	1
Set up mentor program far in advance (≥ 3 months)	3
Have speakers/researchers available for discussion	3
More experienced SOOs as co-leads	1
Break up the course into smaller sessions	5
Portions which SOOs attend (presumes smaller/focused classes)	6
Shorten the course	4
Offer refresher courses for established SOOs	3
More field trips	2
Less lecture -- more lab	1
Instead of paper, distribute a DVD with course materials	1
Make the exams count	1
More classroom breaks	2
Add an experienced SOO/new SOO mentoring program	1
Drop the mentor program	1
Course leads should preview speakers for quality	2
End weather briefings	1
Enhance the mentor program	1

11. Overall (17), were you happy with your experience at COMAP?

Why or why not?

Very Happy	8
Happy	12
No (disappointed)	3
Opportunity for interaction with SOOs/researchers/etc.	9
Nice physical environment (COMET/Boulder)	4
Operationally-oriented presenters	1
Finding out what is important for others in other locations	1
IT Staff	1
Bad mentor experience	1
Didn't bond with class	1
COMET Staff	1
Excellent instructors	2
Haphazardly organized	1
Glaring omissions of material	1
Course too long, too unfocused	1
Course should be like an Executive MBA program	1

Appendix C: NWS SCIENCE & OPERATIONS OFFICER (SOO) JOB AID

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Science and Operations Officer (SOO) Program was initiated in 1990 as a critical component of the NWS Modernization. The position description (PD) for the SOO clearly describes the expected roles of this position. First, the SOO is expected to serve as the senior scientific advisor to the NWS Weather Forecast Office (WFO) Meteorologist-In-Charge (MIC) or NWS National Centers for Environmental Prediction (NCEP) Service Center Director with a primary focus on the assurance of the technical and scientific integrity of all hydrometeorological products and services. *(For the sake of brevity in this document, the term "MIC" will be understood to also include NCEP Service Center Directors, while the term "WFO" will be understood to also include NCEP Service Centers. NCEP Service Center Directors should tailor the guidance provided in this document to their specialized needs and responsibilities.)*

Next, the SOO is fully responsible for initiating, planning, coordinating, and overseeing the transfer of new and emerging scientific technologies and techniques from the research community to the operational forecast and warning environment. Finally, the SOO is expected to participate fully in office operations by working forecast shifts approximately 25% of the time.

However, a recent examination of how SOOs are actually allocating their time on the job revealed noteworthy variations with respect to the PD, as well as variations from one WFO to the next. The variations are due to several factors, including:

- Varying workload requirements based on local weather, topography, and user needs.
- Varying levels of (and opportunities for) local WFO collaborative activities.
- Time differentials in the implementation of applications programs.
- Varying Regional requirements.
- Seasonal variations in workload impacts.
- Differences in staffing profiles, as well as the need to accommodate vacancies.

In the larger picture, SOO duties have necessarily shifted since the original job description was written. On one hand, this is due to the introduction of new NWS hardware, software, and training technologies. Examples include use of and development of procedures on the Advanced Weather Interactive Processing System (AWIPS) Display 2 Dimensions (D2D), the Interactive Forecast Preparation System (IFPS) and the Weather Event Simulator (WES). These are all activities which are now claiming a significant portion of the SOOs' time. On the other hand, Information Technology (IT) implementation and maintenance duties are now better suited to other office staff (e.g., the IT Officer) to enable the SOOs to devote greater emphasis to science and training activities. In any event, there is agreement within the SOO community with the following statement:

The diversity within the SOO program has proven to be one of its strengths!

With the statement above as a foundation, the purpose of this Job Aid is to validate observed differences in SOO duties from one WFO to the next, while still providing broad guidelines SOOs and MICs can use to plan how SOOs will allocate their time to meet the requirements of

the SOO position. It also provides helpful references to support SOOs in accomplishing their goals. This SOO Job Aid was written by a small team of SOOs and a Regional Science Officer, and was facilitated by the NWS Office of Climate, Water and Weather Services (OCWWS) Training Division. It has been ratified by the NWS Regional Directors and the NCEP Director; as well as the Directors of OCWWS, and the Office of Science and Technology.

II. The SOO Position - Prescribed Duties and Observed Variations

SOOs are expected to lead their WFOs in the following areas:

- Serving as the principal science advisor to the MIC.
- Assuring the technical integrity of all hydrometeorological products and services provided by the WFO.
- Initiating, planning, coordinating, and overseeing the transfer of research results into the operational environment.
- Assessing staff training needed to enhance operations and services provided by the office.
- Developing plans, strategies, methods, and materials to meet these training needs.
- Delivering/implementing training on a local basis.
- Ensuring the provision of appropriate training documentation and certification.
- Integrating new training technology into operations.
- Maintaining operational skill by performing the function of Senior Forecaster on shift approximately 25% of the time.
- Contributing to the national science and training program via team participation, sharing of training modules, and participation in regional and national workshops.
- Acting as MIC when necessary.
- Accomplishing all of the above items as they apply to Center Weather Service Units (CWSU) and Weather Service Offices (WSOs) under the responsibility of the WFO management.

There is a variation among offices in terms of how much time SOOs are able to devote to each of the above activities. In view of these variations, but with the overall goals of the SOO Program in mind, Section III outlines the overall roles of the SOO, while Section IV provides more specific suggestions as to how SOOs should aim to allocate their time. Individual office and regional requirements should dictate the level of variance around these suggested goals, and SOOs should work directly with their MICs to establish a specific understanding for their individual offices. Section V contains a listing of SOO tips and resources.

III. Roles of the SOO in the WFO

The SOO is responsible for the scientific integrity of the products produced at the WFO, as well as the processes utilized to produce them. The SOO directly supports achievement of national performance goals. Thus, the SOO serves as both “Science Officer” and as “Operations Officer”. There are additional responsibilities SOOs must perform, including roles as “Senior Forecaster”, “Science Program Manager” and “Office Supervisor”. All of these roles are described in this section.

A. The SOO as ‘Science Officer’

As the Science Officer in the WFO, the SOO leads office training, applied scientific research, and professional development. The goal of these efforts is to transfer scientific findings to the operational environment, thereby improving products and services. Also, the SOO leads the local effort to maintain the staff’s scientific knowledge, and the ability to apply this knowledge during warning and forecast efforts.

The SOO acts as the office “science expert”. In order to maintain currency, the SOO attends train-the-trainer symposia and scientific conferences, and leads local studies designed to address local forecasting challenges. Knowledge gained via training and/or applied studies is then transferred to the local office staff.

Part of the SOO’s job is to maintain contact with the academic and research communities, discuss operational warning and forecast problems with them, and facilitate as much as possible the involvement of the office staff in collaborative applied research efforts. These efforts include ‘Cooperative’ and ‘Partners’ projects sponsored by the NWS/Cooperative Program for Operational Meteorology, Education, and Training (COMET). Collaboration and science sharing with other WFOs, regional and national headquarters (as appropriate), is also strongly encouraged. Further, regular review of scientific journals, research reports, and papers presented at regional and national conferences is important for maintaining scientific currency and professional development. Membership and active participation in scientific and technical societies is also encouraged. In all these regards, the SOO should lead their staff by example.

B. The SOO as ‘Operations Officer’

The SOO and Warning Coordination Meteorologist (WCM) are vital members of the office management team. Collectively, they contribute to meeting the office operational goals. However, for a variety of reasons, the difference in their respective roles can occasionally lose clarity.

Generally, when it comes to the individual thought processes leading to a warning and/or forecast decision, the SOO should play a primary role in ensuring science and technology are coupled with the best conceptual models to produce the best products and services. The essence of this role includes an analysis of situational awareness during the warning process and of failure modes. On the other hand, the WCM should deal primarily with operational readiness and with the consequences after decisions have been made (e.g., adherence to operational policies, proper product dissemination, product clarity, effectiveness of the product to customers).

In reality, every office situation is different and varies by talents and personalities. It is very important for the MIC to devise a local strategy which ensures the relative roles of the SOO and WCM are clear. Experience has proven it is equally critical for the staff to understand the differing job roles between the SOO and WCM to ensure the integrity and consistency of the local management team.

As Operations Officer, the SOO also has responsibility for scientifically preparing the forecast staff for upcoming ‘seasons.’ This usually includes an in-depth review of both appropriate

science and operational procedures as foundations for decision-making. Further, this preparation requires execution of pre-season exercises, utilization of the WES with appropriate training scenarios, and decisions about additional training which may be required. The SOO also works with the MIC to evaluate staff performance in these areas.

Following significant weather events in the County Warning and Forecast Area (CWFA), the SOO should lead scientific assessment of performance. This should include review of (1) the evolution of the meteorology, (2) the decision-making process of the forecast staff, and (3) the verification of warnings, watches and/or critical forecasts. The WES can serve as an important tool for replaying events as part of such reviews, and appropriate events can be developed into WES scenarios for future training use.

In order to accomplish the varied tasks in both science and operations, the SOO coordinates training efforts at the WFO (and CWSU and WSO, as necessary), and must develop a comprehensive knowledge of appropriate training strategies and resources for both scientific and operational topics. While the SOO will carry out some training personally, he or she should accomplish much of the training utilizing focal points or subject matter experts invited from other WFOs, NCEP, or universities. Coordination with the regional Scientific Services Division (SSD) or NCEP Service Center Director can facilitate access to the latter grouping.

C. Other Roles

In addition to the roles described above, the SOO also fulfills those of “Senior Forecaster”, “Science Program Manager” and “Office Supervisor”.

For the purpose of maintaining operational currency, the SOO works shifts as a Senior Forecaster. In this role, the SOO will be able to remain "connected" to operations and to the application of science to forecast problems. Working shifts provides the SOO with insight on potential areas for operational improvement and the opportunity to infuse science into operations.

As Science Program Manager, the SOO works with the entire staff to develop local techniques for applying scientific concepts into operations via the tools available to forecasters (primarily AWIPS). Once this infusion is accomplished, evaluation of new techniques can be accomplished, and their direct impact on warnings and forecasts (and, thus, on attainment of NWS performance goals) can be identified.

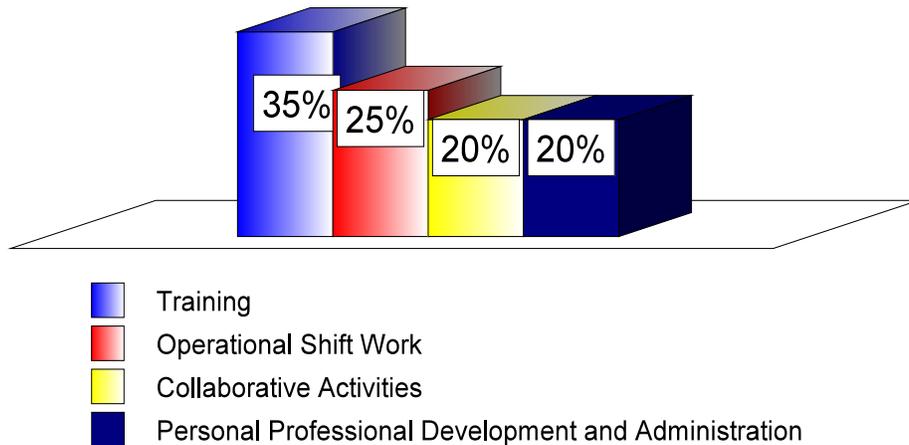
In support of the expectation for the SOO to act as MIC, (i.e., office supervisor), the SOO must be provided with the opportunity for appropriate supervisory, management and leadership training. Interpersonal skills, coaching abilities, and team practices are all essential to the success of the SOO program. NWS training management staff and the regional members to the National Strategic Training and Education Plan (NSTEP) team will work together with the SOO community to develop requirements for SOO management and leadership training.

IV. Suggested SOO Time Allocation

Figure 1 (on the next page) suggests how SOOs may decide to allocate their time:

Time Allocation

Science and Operations Officer



1. Training (35%)

It is strongly recommended SOOs spend at least a third of their total time in the development, delivery, and facilitation of staff training (with 35% presented as a guideline). This does not include SOO Personal Professional Development [PPD] which is discussed below. The NWS is a science-based service organization. An important way to improve office performance is to continually strive to increase staff knowledge of the local area, and to hone their local forecast and warning techniques (and/or skills).

- SOOs are responsible for ensuring each forecaster is proficient in each of the major office programs. These proficiencies should be tracked via seasonal exercises. Deficiencies should be noted and rectified through appropriate training avenues in an expeditious manner. Needed training activities should include (but not be restricted to) the completion of COMET web modules, relevant teletraining sessions, and/or independent study.
- The WES Procedural Directive states each employee is required to successfully complete two simulations for each of two significant weather seasons. Simulations to be completed will be selected jointly after consultation with the MIC.
- The SOO Science and Training Resource Center (STRC) should be utilized to access the available library of existing, SOO-developed training materials for use with their staff. SOOs may modify these materials as needed to avoid fully duplicating training which is already available (e.g., winter weather forecasting, warning decision making and so forth). All SOOs are strongly urged to share electronic presentations they develop with the rest of the NWS by submitting them to COMET for inclusion in the STRC. The most important qualification for inclusion is a demonstrated focus towards improving NWS operations.

- SOOs will work with their MICs to oversee proper use and administration of the NWS Learning Management System (LMS) at the local level. The NWS LMS will provide the facility for SOOs to keep track of training records and evaluate training progress of staff at their office. It will also allow for scheduling of in-residence, teletraining, and local courses offered for NWS staff.

2. Operational Shift Work (25%)

- It is necessary for SOOs to maintain the operational connection to their staff, and to be able to make recommendations to the MIC for future changes and improvements in the operational arena. In order for SOOs to effectively accomplish these goals, SOOs should strive to devote approximately 25% of their total time to shift work. This percentage will vary from office to office according to local priorities and staffing considerations.
- There may be cases where the degree of SOO shift work interferes with accomplishment of the other critical elements outlined in this document. In such cases, the SOO should discuss resolution of this issue with his/her MIC and regional SSD. This will facilitate discussion at both the regional and national levels as to how best remedy any deficiencies in performing the other critical elements which arise due to excessive SOO shift work.

3. Collaborative Activities (20%)

- SOOs should facilitate and oversee collaborative activities such as applied scientific research with universities and/or NOAA laboratories through COMET, and through the NWS Collaborative Science, Technology, and Applied Research (CSTAR) program. Involvement of office staff is necessary to enhance individual professional development and to promote the sharing of newer ideas, research results and/or technologies. Results should be directly infused into the improvement of the forecast and warning services provided by the NWS. It is recognized the amount of collaboration individual SOOs can perform will depend on many factors, not the least of which is whether or not an office is collocated with (or near) a university.
- SOOs should share the results of locally developed training and applied science, and COMET collaborative projects, with other SOOs. This may be accomplished through the use of the Internet (e-mail, SOO Science and Training Resource Center (STRC), web sites), visiting scientist programs, office visits, and regional or national conferences.

4. Personal Professional Development (PPD) and Administration (20%)

- A strong PPD Program helps ensure SOOs are equipped to provide high quality training to operational staff, as well as to effectively integrate new science and technology into operations. SOOs should budget their time away from the office for PPD consistent with local office needs and limitations.
- SOOs must strive to remain scientifically current. This may be accomplished through routine review of articles, technical documents, attendance at professional seminars, workshops, and/or meetings.

- Due to the interrelationship between technology and operations, SOOs should continue to work closely on these issues with the ITO, Electronics Systems Analyst (ESA), MIC, and others as required. Examples of technology for which coordination is required include IFPS Grid Forecast Editor, the Workstation ETA, WES, BUFKIT, AWIPS Volume Browser, AWIPS Product Maker, and AWIPS D2D procedures.
- As alluded to in Section III, SOOs also require training on management, leadership, and on how to maximize the benefits of training. This training will include (but not necessarily be restricted to):
 - Attendance at the NWS Training Center's (NWSTC) Management & Supervision course or Field Operations Management Course.
 - Attendance at NWSTC's Executive Leadership Seminar (ELS).
 - Participation in NWS-specific training to be developed for all staff on effective interpersonal communications.
 - Participation in initiatives designed to raise awareness on how to design/provide effective training, as well as on how to accurately evaluate the effectiveness of training.
- SOOs must also attend to various day-to-day administrative duties ranging from responding to e-mail to acting as MIC. It is important SOOs master skills which allow them to effectively manage their administrative duties so as to minimize the impact on their other responsibilities.

SOOs should work with their MIC to formulate their Individual Development Plans (IDP) and should play a major role in the development of annual office training plans. However, the MIC should be generally responsible for the oversight of IDP development and maintenance for all other staff within the office. The SOO may assist with staff IDPs at the request of the MIC.

V. SOO Tips and Resources

Regional and national support for the diverse needs of the SOO are available via:

- Routine regional SOO coordination calls.
- Office visits by their regional SSDs.
- Regional and national SOO workshops.
- Sharing of information via the SOO STRC.
- Regional and national SOO e-mail lists, and regional staff notes.

It is suggested SOOs keep careful records of all training activities in the office through the NWS LMS. It is further suggested SOOs prepare a "SOO Web Page" with quick reference materials for operational staff, as well as a training and information resource for the office. This may be part of the SOO's office intranet page.

Please use this document as a guide to ensure your smooth transition as a SOO, whether you are a long time NWS employee or new to the NWS! The following are several resources critical to the role of the SOO as the scientific and operational leader of the WFO:

National Weather Service Training Portal:

<http://www.nwstc.noaa.gov/nwstrn/>

Professional Development Series:

<http://www.nwstc.noaa.gov/nwstrn/d.ntp/pds.html>

SOO Science and Training and Resource Center:

<http://www.comet.ucar.edu/strc/>

AMS on-line journal access:

<http://ams.allenpress.com/amsonline/?request=index-html>

Meteorology Training and Education (MetEd):

<http://www.meted.ucar.edu/index3.htm>

Warning Decision Training Branch:

<http://www.wdtb.noaa.gov/>

VISIT Teletraining:

<http://www.cira.colostate.edu/ramm/visit/ecal.asp>

Individual Development Plans:

<http://www.nwstc.noaa.gov/nwstrn/d.ntp/idp-info.html>

SOO Resource Handbook:

<http://meted.ucar.edu/resource/soo/soobook.htm>

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