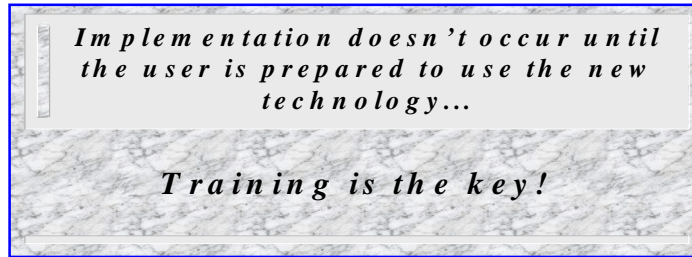


### Part 3 - Special Focus Areas



**“Training must be an integral part of the transition of new technology to operations”**  
*--July 2000 Aviation Weather User Forum*

The issue of training, as an integral part of the process of transitioning new technologies to operations, generated pointed discussion at the July 2000 Aviation Weather User Forum. During panel discussions on aviation weather training there was consensus that the implementation of new technologies and capabilities (i.e., full operational use of new or revised products and programs) is not being maximized due to the lack of or insufficient training. With this in mind, a key objective of this follow-on Tier 3/4 training review is to determine to what extent Tier 3/4 programs are taking training into account in their overall research, development, and fielding strategies.

The adjacent table indicates that most Tier 3/4 programs have implemented training (forty-two percent) or are in the process of developing training components to meet the training needs of operational users and providers of weather information (thirty-eight percent). Of the remaining twenty percent, the majority are either very early in the research and development cycle – too early to address training – or are programs for which a training component is not applicable. *Although it appears that training is a part of overall development and fielding strategies, it is essential that training be made available to all operational users and providers affected by new programs. Ensuring access to training for all potential training candidates should be a primary consideration when implementing new aviation weather programs.*

<b>Status of Tier 3/4 Training</b>						
Tier 3/4 Programs	Type:			Training Component Status		
	Systems-S	Products-P	Training-T			
	S	P	T	Implemented	Under Dev	Other
<b>FAA: (23)</b>						
Totals	13	10	0	14	3	6
Percent	57	43	0	61	13	26
<b>NASA: (12)</b>						
Totals	10	1	1	2	2	8
Percent	84	8	8	17	17	66
<b>NOAA: (14)</b>						
Totals	5	9	0	2	11	1
Percent	36	64	0	14	79	7
<b>DoD: (21)</b>						
Totals	17	4	0	12	9	0
Percent	81	19	0	57	43	0
<b>IND/Univ: (19)</b>						
Totals	13	5	1	7	9	3
Percent	68	26	5	37	47	16
<b>Total : (89)</b>	<b>58</b>	<b>29</b>	<b>2</b>	<b>37</b>	<b>34</b>	<b>18</b>
<b>Overall Percent</b>	<b>65</b>	<b>34</b>	<b>2</b>	<b>42</b>	<b>38</b>	<b>20</b>

***“Products and training should be tailored to the unique needs of different users”***

*--July 2000 Aviation Weather User Forum*

The issue of tailored training was also raised and discussed during the July 2000 Aviation Weather User Forum. Within the aviation weather community, functional roles and responsibilities, levels of supervision, management and oversight, and functional areas and skill levels vary widely. The tasks performed by both users and providers at all levels are numerous and diverse and training must be tailored to meet these diverse needs. To determine if both planned and implemented Tier 3/4 training satisfies the unique needs of potential trainees, we considered several training parameters:

- ⇒ Training should be designed to meet the unique needs of different functions within the user and provider communities.
- ⇒ Levels of training should also be tailored to different skill levels within each function.
- ⇒ Training methods should be varied, used in combination or alone, and flexible enough to meet the increasingly stringent time and accessibility constraints of trainees.
- ⇒ Training resources should be from a variety of options appropriate for the training objectives.
- ⇒ Training length, group size, and the trainer-to-trainee ratio should be designed to balance cost effectiveness with efficiencies of training.

***Training should be designed to meet the unique needs of different functions within the user and provider communities.***

The extract on the next page from Appendix B provides an indication of the extent to which Tier 3/4 training is provided to, is under development for, or is otherwise appropriate for the range of functional areas within the aviation weather user and provider communities.

Users/Providers by Function																	
Programs	Designated Trainees				Users								Providers				
	Users	Prov	Both	Other	ATC	Trfc Mgr	Disp	GrndOps	FitStan	NTSB	Pilots	Nav	DoD F/M	NWS F/M	Univ/Lab	Priv Sec	Other
<b>FAA: (23)</b>																	
Totals	6	1	10	6	16	11	12	1	1	7	7	0	3	11	2	8	6
Percent	26	5	43	26	70	48	52	5	5	30	30	0	13	48	9	35	26
<b>NASA: (12)</b>																	
Totals	6	2	2	2	4	3	4	0	1	1	6	1	2	3	2	2	0
Percent	50	17	17	17	33	25	33	0	8	8	50	8	17	25	17	17	0
<b>NOAA: (14)</b>																	
Totals	0	2	11	1	8	7	8	2	2	8	6	4	10	12	8	10	1
Percent	0	14	79	7	57	50	57	14	14	57	43	29	71	86	57	71	7
<b>DoD: (21)</b>																	
Totals	0	13	6	2	3	0	1	1	0	1	5	2	19	4	1	0	2
Percent	0	62	29	9	14	0	5	5	0	5	24	9	91	19	5	0	9
<b>IND/Univ: (19)</b>																	
Totals	10	0	7	2	8	7	8	1	2	5	15	1	3	6	1	4	0
Percent	53	0	37	10	42	37	42	5	10	26	79	5	16	32	5	21	0
<b>Total : (89)</b>	<b>22</b>	<b>18</b>	<b>36</b>	<b>13</b>	<b>39</b>	<b>28</b>	<b>33</b>	<b>5</b>	<b>6</b>	<b>22</b>	<b>39</b>	<b>8</b>	<b>37</b>	<b>36</b>	<b>14</b>	<b>24</b>	<b>9</b>
<b>Overall Percent</b>	<b>25</b>	<b>20</b>	<b>40</b>	<b>15</b>	<b>44</b>	<b>31</b>	<b>37</b>	<b>6</b>	<b>7</b>	<b>25</b>	<b>44</b>	<b>9</b>	<b>42</b>	<b>40</b>	<b>16</b>	<b>27</b>	<b>10</b>

*This summary shows that both users and providers from virtually all areas of the aviation weather community are being considered for training. When viewing these results, one should keep in mind that the output of each Tier 3/4 program, in most cases, is a product, a system, or a procedure designed to meet the operational needs of specific sectors of the aviation weather community and sometimes specific functional areas. It is also apparent from these data that training is being tailored not only for users and providers but also for various functional areas within the user and provider communities.*

Levels of Training				
Programs	Training Levels			
	B	I	A	Other
<b>FAA: (23)</b>				
Totals	13	6	6	6
Percent	57	26	26	26
<b>NASA: (12)</b>				
Totals	7	5	1	4
Percent	58	42	8	33
<b>NOAA: (14)</b>				
Totals	12	11	11	1
Percent	86	79	79	7
<b>DoD: (21)</b>				
Totals	20	14	5	1
Percent	95	67	24	5
<b>IND/Univ: (19)</b>				
Totals	14	6	3	2
Percent	74	32	16	10
<b>Total : (89)</b>	<b>66</b>	<b>42</b>	<b>26</b>	<b>14</b>
<b>Overall Percent</b>	<b>74</b>	<b>47</b>	<b>29</b>	<b>16</b>

*Levels of training should be tailored to different skill levels within each function.*

The adjacent table indicates that training programs are being developed and implemented to address the full range of subject knowledge and task performance training needs of designated trainees at all skill levels. This ranges from the training of new trainees with little or no background knowledge in the subject area to experienced trainees with high levels of experience and expertise in the functional area or field of study. In many programs, training components are capable of meeting all three levels of training: basic, intermediate, and advanced. Training levels are described further in Part 1 of this chapter.

*Training methods should be varied, used in combination or alone, and flexible enough to meet increasingly stringent time and accessibility constraints of trainees.*

The adjacent table indicates that a wide variety of training methods are being used. Individual training responses indicate that combinations of methods were often used. Computer based training was cited as the method used most often and there continues to be almost as high a reliance with on-the-job-training. Several program managers expressed the efficiency of training links available directly on web pages of operational products. They stated that training links specifically designed for individual products proved to be an extremely effective and convenient tool. *There is no “single best method” of providing training. Program and training managers should continue to use the variety of training methods at their disposal and implement those, alone or in combination, that best meet the particular training objective, resource constraints, and time and availability constraints of designated trainees.*

Training Methods								
Program	Training Method							
	CBT	CL	Lab	Ss	DL	OJT	Site	Othr
<b>FAA: (23)</b>								
Totals	14	6	6	4	0	13	4	6
Percent	61	26	26	17	0	57	18	26
<b>NASA: (12)</b>								
Totals	3	0	2	3	1	2	0	6
Percent	25	0	17	25	8	17	0	50
<b>NOAA: (14)</b>								
Totals	9	3	3	3	2	4	2	4
Percent	64	21	21	21	14	29	14	29
<b>DoD: (21)</b>								
Totals	10	7	3	8	1	14	8	5
Percent	48	33	14	38	5	67	38	24
<b>IND/Univ: (19)</b>								
Totals	3	8	3	4	0	4	3	11
Percent	16	42	16	21	0	21	16	58
<b>Total : (89)</b>	<b>39</b>	<b>24</b>	<b>17</b>	<b>22</b>	<b>4</b>	<b>37</b>	<b>17</b>	<b>32</b>
<b>Overall Percent</b>	<b>44</b>	<b>27</b>	<b>19</b>	<b>25</b>	<b>5</b>	<b>42</b>	<b>19</b>	<b>36</b>

*Training resources should be from a variety of options appropriate for specific training objectives.*

Training Delivery Resources								
Program	Training Delivery Resources							
	CBI	Prod	Sys	TrSys	Proto	Sim	TstBd	Othr
<b>FAA: (23)</b>								
Totals	14	4	7	1	1	0	0	6
Percent	61	17	30	5	5	0	0	26
<b>NASA: (12)</b>								
Totals	2	2	1	0	1	2	0	6
Percent	17	17	8	0	8	17	0	50
<b>NOAA: (14)</b>								
Totals	9	6	2	2	3	2	4	4
Percent	64	43	14	14	21	14	29	29
<b>DoD: (21)</b>								
Totals	10	11	13	0	0	1	2	6
Percent	48	52	62	0	0	5	9	29
<b>IND/Univ: (19)</b>								
Totals	4	7	6	6	1	1	1	10
Percent	21	37	32	32	5	5	5	53
<b>Total : (89)</b>	<b>39</b>	<b>30</b>	<b>29</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>32</b>
<b>Overall Percent</b>	<b>44</b>	<b>34</b>	<b>33</b>	<b>10</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>36</b>

As is the case with training methods, a variety of training resources is being used for training. As shown on the adjacent table, computer based resources were the most commonly cited. Operational products and systems were used more often than training systems. As with training methods, there is no “overall, single best resource” to deliver training. Program and training managers should use a resource or a combination of resources most suitable to the training objective, also taking into account the training availability constraints of trainees.

***Training length, group size, and trainer-to-trainee ratio should be designed to balance cost effectiveness with efficiencies of training.***

The following table provides information on training length, group size, and training ratios. In general, training lengths appeared to be relatively short, averaging six hours for users and eleven hours for providers. Group sizes were also relatively small, averaging nine students. Trainer-to-trainee ratios appear to be very student centered, the majority averaging one instructor to one to six trainees, with no responses indicating ratios greater than one instructor to twelve students. The use of computer assisted training and other less instructor intensive methods of training seem to have offset the need for numerous instructor hours of instruction. This also allows students to have better control of the training process making it possible for them to learn at their own pace.

Training Lengths, Group Sizes, Training Ratios												
Program	Training Length (hrs)			Group Size				Trainer to Trainee Ratio				
	User	Prov	Othr	Min	Dsrd	Max	Othr	SS	1to6	6to12	>12	Othr
<b>FAA: (23)</b>												
Totals	Range: 1-40		7	Range: 1-12			7	6	9	1	0	7
Percent			30				30	26	39	5	0	30
Average	3	2		2	3	5						
<b>NASA: (12)</b>												
Totals	Range 4-24		9	Range 1-2			9	2	1	0	0	9
Percent			75				75	17	8	0	0	75
Average	5	15		1	2	2						
<b>NOAA: (14)</b>												
Totals	Range: 2-16		4	Range: 1-30			8	0	3	2	0	7
Percent			29				57	0	21	14	0	50
Average	8	8		5								
<b>DoD: (21)</b>												
Totals	Range:4-80		7	Range: 1-20			7	0	11	3	0	7
Percent			33				33	0	52	14	0	33
Average	4	30		2	6	9						
<b>IND/Univ: (19)</b>												
Totals	Range: 2-40		11	Range: 1-150			11	1	3	4	0	11
Percent			58				58	5	16	21	0	58
Average	10	24		5	26	46						
<b>Total : (89)</b>	Range: 1-80		38	Range: 1-150			42	9	27	10	0	41
<b>Overall Percent</b>			43				47	10	30	11	0	46
<b>Overall Averages</b>	6	11		3	9	16						

***“Training needs to be an integral part of product/program development”***

*--July 2000 Aviation Weather User Forum*

<b>Status of Tier 3/4 Training</b>						
Tier 3/4 Programs	Type:			Training Component Status		
	Systems-S	Products-P	Training-T	Implemented	Under Dev	Other
<b>FAA: (23)</b>						
Totals	13	10	0	14	3	6
Percent	57	43	0	61	13	26
<b>NASA: (12)</b>						
Totals	10	1	1	2	2	8
Percent	84	8	8	17	17	66
<b>NOAA: (14)</b>						
Totals	5	9	0	2	11	1
Percent	36	64	0	14	79	7
<b>DoD: (21)</b>						
Totals	17	4	0	12	9	0
Percent	81	19	0	57	43	0
<b>IND/Univ: (19)</b>						
Totals	13	5	1	7	9	3
Percent	68	26	5	37	47	16
<b>Total : (89)</b>	<b>58</b>	<b>29</b>	<b>2</b>	<b>37</b>	<b>34</b>	<b>18</b>
<b>Overall Percent</b>	<b>65</b>	<b>34</b>	<b>2</b>	<b>42</b>	<b>38</b>	<b>20</b>

As shown in the adjacent table, eighty percent of Tier 3/4 programs have either implemented a training component or have training components under development. This indicates that training is an integral part of program development and acquisition processes. It must continue to be emphasized however, that training should not be an afterthought in the overall program development and acquisition process. The most effective training programs, and often the most efficient programs, are those that consider training during all stages of program development and during each phase of product or system implementation.

***“We need to find and facilitate opportunities to leverage and collaborate training among the Federal Agencies, Industry, Universities, and where appropriate the Private Sector”***

*--Samuel P. Williamson, The Federal Coordinator*

The April 2001 Tier 3/4 Baseline Report provided a unique reference, from across the aviation weather community, that identified and provided basic information on new and emerging aviation weather related programs. A major benefit of compiling such a reference is that it can easily be reviewed by all agencies to determine if there are opportunities for collaboration, cooperation, and leveraging. The same holds true for aviation weather training. This aviation weather training report provides a first of its kind training baseline that can be used to determine opportunities for collaboration, cooperation and leveraging.

During the analysis of the Tier 2 training initiatives (Chapter 2, Part 2), possible opportunities for leveraging are identified. Certainly, further evaluation by aviation weather program managers, program training managers, and work-center supervisors and training managers is required in order to fully consider these opportunities to reduce training redundancies, access needed training, and minimize training development costs.

*As part of the process of considering development and implementation of new aviation weather training programs, program managers and training managers should review and evaluate what is already under development or in existence within the aviation weather community. The training templates that are the primary source of data for this report should be kept current as much as possible in order to serve as a training reference for the aviation weather community.*

### **COMET and the National Weather Association**

While gathering Tier 3/4 training information for this report, we became aware of several additional training initiatives that address the training needs of users and providers of weather information. The National Weather Service makes use of several courses developed and provided by the Cooperative Program for Operational Meteorology, Education and Training (COMET). These courses are designed to teach forecasters and meteorologists the latest methods for forecasting aviation weather hazards. Also, the National Weather Association's Aviation Committee has developed two internet-based training courses. One course addresses winter weather flying and the other addresses flying in thunderstorms. The uniqueness of some of these courses is that they are internet-based, easily accessible, self-paced, and free of charge.