ARAC Reserve Duty Time Working Group
Industry/Management Report

Background and Introduction

The assignment of the Aviation Rulemaking Advisory Group (ARAC) Reserve Duty/Rest Working Group (RDWG) was announced by the Federal Aviation Administration (FAA) in the Federal Register on July 9, 1998. The task assigned and accepted by the RDWG was to provide a review and analysis of industry practice with regard to reserve pilot duty assignments and to provide recommendations to the ARAC and ultimately to the FAA on revisions to applicable Federal Aviation Regulations (FARs) governing reserve pilot flight and duty time assignments.

The RDWG was asked to report on six specific tasks and to complete the report by December 1, 1998. That date was subsequently extended to January 15, 1999.

When FAA issued the latest Notice of Proposed Rulemaking on Flight and Duty Time (NPRM 95-18), which included proposals for reserve rest rules in December, 1995, a large volume of comments were provided to the FAA that underscored the difficulty of crafting a rule which could reasonably allow for the wide array of differences between various types of operations (e.g. labor contracts, international vs. domestic, scheduled vs. non-scheduled, FAR Part 121 vs. 135, on-demand, supplemental, etc.). Thus, the task assignment drafted by the FAA also included a provision for the RDWG to provide recommendations that accommodated these differences in a reasonable fashion.

The first public meeting was held on August 12-13, 1998, and subsequent public meetings were held on September 1-2, October 1-2, October 29-30, and December 2-3. Numerous additional sub-group meetings were held at various times between the public meetings, which were all announced in the Federal Register. The RDWG was constituted by the ARAC with members representing a broad array of constituencies from various industry and labor groups. In addition, approximately 25-30 other stakeholders, government representatives, and other interested parties were present at one or more meetings during the RDWG deliberations.

Many different viewpoints were presented during the course of the RDWG discussions, and unfortunately, no overall consensus emerged. There were major differences between final labor and management proposals. In fact, by the end of the October 29-30 meeting, two distinctly different labor positions had emerged, and it is not clear that these differences were resolved by the final public meeting.

A single industry/management proposal covering FAR Part 121, scheduled operations was developed and agreed to by those members. That proposal is included in Attachment 1, a December 30, 1998 letter from the Air Transport Association (ATA) representative to me as industry/management co-chairman of the RDWG. Although it is referred to in Attachment 1 as the "ATA position," the proposal therein was developed by the entire RDWG industry/management group.

In addition, a consensus industry/management proposal was reached for Part 121, non-scheduled operations, which recognized that certain types of operations could not function

under the same types of reserve rules appropriate to scheduled operations. At least several RDWG labor representatives also agreed to this proposal, despite the lack of an overall consensus. This proposal is included in Attachment 2.

It was also generally agreed by the industry/management group that the Part 121, scheduled reserve rest proposal should not apply to Part 135 operations for many of the same reasons. Two proposals were submitted for Part 135 operations, one by the Helicopter Association International (Attachment 3) and one for Part 135, non-scheduled operations by the National Air Tranportation Association and the National Business Aircraft Association (Attachment 4).

This report is organized below according to the six primary tasks as published in the Federal Register RDWG assignment. This industry/management report includes a summary of the views of the Air Transport Association of America, Helicopter Association International, National Air Carrier Association, National Air Transportation Association, National Business Aviation Association, and the Regional Airline Association, as well as the members of these organizations.

Industry/Management Responses to Specific Tasks

Task 1: Review of current scientific data on the effects of fatigue in reserve duty. Consider conflicting opinions.

The first public meeting included an extensive discussion of the relevant scientific literature, and whether any new data pertaining to this issue had emerged since the issuance of NPRM 95-18. It was generally agreed that there were no significant new scientific studies relevant to the reserve duty question published since that time.

It was frequently pointed out by the industry/management group that there have been no known accidents where the probable cause was deemed to be pilot fatigue associated with reserve duty assignments. In the minds of many RDWG members, this was relevant to the question of whether changes to the existing rules should be a regulatory priority.

Extensive discussions ensued that illustrated the fact that the scientific literature pertaining to this issue can be interpreted in a variety of ways. As a result, many different and sometimes inconsistent conclusions can be drawn, and thus, there are no clear answers from the body of scientific literature as to appropriate regulatory policy.

The RDWG did agree that there are two very broad scientific principles specifically relevant to reserve duty. First, it was agreed that humans generally need the opportunity to acquire approximately 8 hours of sleep per 24 hour period. Second, it was agreed that fatigue is more probable during the period of time encompassing approximately 0200 to 0600, which roughly corresponds to the low point in an "average" (across the population) human circadian cycle.

However, it was also noted that the scientific literature demonstrates that humans, in general and pilots in particular, are highly variable in their sleep habits, lifestyles, and circadian cycles. This phenomenon poses significant and difficult complications for FAA regulatory policy on flight and duty time. An appropriate rest opportunity (no matter how long) cannot guarantee that a particular reserve pilot will obtain appropriate sleep. In addition, because of the high degree of variability in individual sleep habits and lifestyles, it is difficult to know the nature and timing of a particular individual's circadian cycle. For example, since a large percentage of pilots commute across multiple time-zones to both

reserve and scheduled duty assignments, it is difficult to assess the particular timing of an individual's circadian cycle vis a vis a particular flight assignment.

Thus, the rationale underlying the industry/management proposal is that, at best, reserve rest rules can only reasonably provide for an appropriate rest opportunity. They cannot guarantee that every individual pilot is "appropriately rested" prior to a flight assignment. It is incumbent upon each individual pilot to accept personal responsibility for obtaining adequate rest, given reasonable opportunities provided for rest.

The majority of RDWG members agreed that the ideal method for providing this opportunity is through the provision of a "protected time period" (PTP) of approximately 8 hours during which time a reserve would be undisturbed for the purpose of rest. It was also acknowledged that the PTP should not change more than a few hours from one day to the next. Consensus was reached that this is the most effective method in "normal," scheduled operations. However, because of the need for flexibility to recover from routine weather-related and other types of frequent disruptions, an alternative, acceptable method is to provide appropriate advance notification so that an individual has the opportunity to obtain rest.

In addition, it was recognized by most that a PTP-based reserve rest scheme would be difficult, if not impossible, to implement by many Part 121, non-scheduled operators and/or Part 135 operations (scheduled and non-scheduled) because of the small numbers of crews involved in such operations. Thus, an alternative was deemed to be necessary for non-scheduled and other Part 135 operations.

At the first public meeting, the RDWG reached a consensus that reserve duty is neither duty nor is it rest. It is also important to recognize that a reserve duty day is a work day, and should not be treated as a day off, regardless of whether a reserve pilot is called for a flight assignment. These observations point to the fact that there are often opportunities for rest during reserve availability periods (RAPs), since reserves are frequently not called for flight assignments until later in an availability period, due to the nature of network operations, if at all. Schedule disruptions are more common later in the day due to the "snowball effect," as various schedule discrepancies are compounded throughout the course of a normal operational day. It is incumbent upon those serving in reserve assignments to utilize all available opportunities for rest.

RDWG discussions of the scientific literature also included research by the National Aeronautics and Space Administration (NASA) which demonstrated that even brief naps (approximately 45 minutes) can significantly enhance alertness and serve as an effective countermeasure to fatigue. This underscores the responsibility reserve pilots have to utilize all available rest opportunities during RAPs.

Task 2: Analysis of current reserve schemes and operational situations

Extensive discussions of current practices illustrated that there is a wide variety of reserve schemes currently in place. This is due to the almost infinite differences in types of operations, negotiated contract-imposed work-rules, equipment types, areas served, etc. These discussions illustrated the difficulty of developing a single rule that would not impose a disproportionate impact upon a particular type of operation, and leads to the conclusion that a single rule would not be in the public interest.

It was further demonstrated by the management group that the majority of major airlines (affecting the vast majority of U.S. professional pilots) had negotiated work-rules governing reserve assignments that had factored in the characteristics of a particular

organization's operation. Thus, it was asserted that any rule change must be broad and flexible enough to take these negotiated work-rules and operational differences into account without disproportionate impact on a particular carrier.

As a result of these discussions, industry/management members proposed that the best alternative for reserve flight and duty time rulemaking would be to allow individual operators to develop detailed, individually-tailored operations specifications governing reserve duty that would be approved by each organization's FAA Certificate Management Office. This approach is identical to the way FAA currently manages other operations specifications governing flight operations, training programs, and approved maintenance programs. It is also similar to FAA's program for approving advanced training programs, the advanced qualification program (AQP). While many RDWG members, representing all interests, understood the merits of this approach, consensus could not be reached. All industry/management representatives preferred this approach.

Task 3: Recommendations on standards and criteria

After several public meetings, two basic schemes were proposed for providing reserve pilots opportunities for rest or limiting the duty day based upon the amount of advance notice of a flight assignment. The first scheme involved providing a scheduled PTP for all reserve pilots, but also allowed the use of advance notification to either cancel a scheduled PTP or to utilize a reserve on a "sliding scale" where the length of the duty day would be dependent upon the amount of advance notification. It was generally recognized that these provisions were necessary to provide for the flexibility needed by operators to recover from disruptions to normal operations. It would be fair to say that the full RDWG reached a consensus on this conceptual approach. The second scheme simply limited the duty day based upon the amount of advance notification. The latter is very similar to regulations proposed in NPRM 95-18.

After extensive discussions, the RDWG agreed to attempt to reach a consensus for Part 121, scheduled operations on the first scheme, where most pilots would receive a PTP, with an appropriate mechanism for the utilization of advance notification in lieu of PTPs under circumstances associated with deviations from normal operations. The second scheme was proposed as an alternative for Part 121, non-scheduled, and Part 135 operations.

The industry/management proposal for Part 121, scheduled operations is presented in Attachment 1. Attachment 2 contains the Part 121, non-scheduled proposal. As previously mentioned, it was difficult to ascertain whether there was a single agreed upon labor proposal by the end of the last public meeting. The basic differences between the final positions of various labor proposals and the industry/management proposal were associated with the amount of time devoted to PTPs, length of RAPs, and the amount of advance notification necessary to cancel PTPs, modify RAPs, as well as how advance notification should affect the amount of allowable duty time.

Industry/management RDWG members firmly maintain that their final proposal for 121, scheduled operations to provide a minimum 8 hour rest period or 10 hours of advance notification, under most circumstances, prior to a flight assignment is consistent with the state of scientific knowledge and provides more than adequate protection for reserve pilots to complete a flight assignment safely and legally. It is significant that the final RDWG industry/management proposal is far more restrictive with respect to rules governing reserve assignments than either those proposed by the FAA in NPRM 95-18 or current rules, neither of which have provisions for PTPs covering the vast majority of reserve pilots in U.S. domestic service.

The final labor proposal(s) included longer PTPs, longer and more extensive advance notification requirements, shorter RAPs, and restrictions on allowable duty time based upon time of day. The industry/management RDWG members maintain that the benefits which might possibly be derived from the labor proposal(s)' more restrictive parameters are suspect, at best, and not supported either by the scientific literature or by the safety record, in light of the substantial additional burden that would be placed up the industry and the U.S. air transportation system (see task 5 below).

Task 4: Recommendations on how FAA will measure compliance

With regard to the industry/management proposals, there was no disagreement within the RDWG that the FAA would be able to measure compliance in the same way it currently assesses flight and duty time regulatory compliance. It was noted that most automated record keeping systems could be modified to accommodate the proposed changes within 6 to 12 months from the date of publication, depending upon the complexity of a new rule.

Task 5: Economic Impact

Industry/management representatives compiled the available economic data pertaining to the costs of the proposal provided in Attachment 1. It was estimated that the cost of that rule change would be approximately $100 million in incremental costs to the major operators that provided economic data (primarily ATA member airlines). Most of these costs are necessitated by the requirement to hire additional reserve pilots and the associated costs of training both the additional new pilots required and part of the existing pilot population because of the "upward bumping" phenomenon created by most contract-imposed seniority systems during periods when new pilots are being hired.

No economic data were provided by smaller Part 121 operators, Part 135 operations, or other types of operations, but it is probable that the total cost to industry would be significantly greater than $100 million. In addition, it was maintained that some smaller unscheduled operators might have to cease operations under some of the labor proposals. It was also asserted that these proposals would substantially alter the nature of many collective bargaining agreements.

The RDWG was unable to perform additional detailed economic analyses comparing the various proposals. This was due to the fact that: 1) these analyses are very complex and time-consuming, and 2) it was difficult to ascertain how to conduct comparative analyses of competing labor proposals, because a single labor proposal had not emerged by the deadline associated with the final public meeting and the task assignment.

However, exploratory analyses did indicate that very small increases in PTPs, advance notification requirements, and corresponding decreases in RAPs (as outlined in the labor proposal closest to the industry/management proposal) caused significant increases in the number of reserves required to cover current operations. As an illustration of why this dramatic increase occurs, one major air carrier currently staffs about 45 different reserve positions because it operates many different types of aircraft and has multiple crew bases. These circumstances are common to most major airlines (e.g. the number of reserve positions equals the number of crew bases times the number of seat positions in each base--captain vs. first officer vs. second officer--times the number of aircraft types operating in each base). In most cases, there are only a handful of reserves in each category (often as few as 1). One major carrier has estimated that it costs approximately $1 million in salary, benefits, and training costs (initial and upward bumping) for every 7 pilots it initially hires. For this carrier, a one or two hour increase in PTP duration and corresponding reductions

in RAPs from the industry/management proposal would require it to add at least one reserve to every category. As a result, the minimum incremental cost for this single airline would be $6-7 million, assuming only one reserve is necessary in each category. These incremental costs over and above the final industry/management proposal are expected to be similar for each major airline. Thus, the potential incremental costs of competing labor proposal(s) could be perhaps double (in the "best" case) or significantly more (in the "worst" case) than the cost estimates associated with the industry/management proposal.

Alternatively, a carrier could choose not to staff the additional reserves that would be required to cover contingencies imposed by more stringent reserve rest requirements. Of course, this would cause significantly more flight cancellations than are common under current rules and a resulting negative impact on the U.S. air transportation system.

In summary, even small (1 or 2 hr.) increases in advance notification requirements, PTPs, or corresponding reductions in RAP, or duty day would cause an operator to add additional reserves in each reserve category to provide at least minimal coverage. The associated incremental costs would be substantial over and above the final RDWG industry/ management proposal.

Reserve pilots, by definition, are necessary because an operator never knows when or if they will be required. In normal operations many, if not most, reserve pilots are never called for an assignment. In short, the economic consequences of the industry/management proposal are significant, but all competing labor proposals are significantly more costly. Thus, the arguably questionable benefits of any rule change must be carefully considered in light of the large additional economic burden imposed upon air transportation providers.

Task 6: Assessment of record-keeping burden

The RDWG was unable to assess the specific additional record-keeping burden since a consensus was not reached on a proposed rule. However, as previously reported, any rule change would require each operator to make changes to it's record-keeping system, which would result in some incremental cost.

In addition, it is expected that FAA would need to either add additional inspectors to monitor compliance with more complex rules than those presently in place, or alternatively, FAA would be required to reduce surveillance in other areas. The RDWG was not in a position to advise the ARAC or the FAA on this internal policy matter.

Respectfully submitted,

H. Clayton Foushee
ARAC RDWG Industry/Management Co-Chairman

Attachment 1

Air Transport Association

December 30, 1998

Mr. H. Clayton Foushee
Vice President-Regulatory Affairs
Northwest Airlines
901 15th Street, N.W. Suite 310
Washington, DC 20005

Dear Clay:

As co-chairman of the Aviation Rulemaking Advisory Committee (ARAC) Working Group on Pilot Reserve Rest, you are aware that the final meeting of that group was held on December 2, 1998. The working group was originally given a task deadline of October, but that date was extended until December. Notwithstanding the extension and despite a good-faith effort from all who participated, a consensus position was not reached.

The ATA reserve rest proposal, discussed at length during the ARAC Working Group meetings, effectively addresses the issue of prospective rest for pilots in reserve status. Attached is the final ATA proposal, which represents the collective position of our member airlines. Our proposal calls for a Protected Time Period (PTP) for each reserve pilot of a minimum of eight consecutive hours. This period of pre-scheduled rest is time when a pilot is free from all duty and has no present responsibility for work. ATA operators anticipate that the majority of reserve pilots will fall into this category.

By definition, reserve pilots are needed to protect schedule integrity when unpredictable events occur. To account for these irregularities, ATA operators require greater flexibility than is afforded by simply scheduling reserve pilots with protected rest periods. Therefore, a system is needed that provides both the flexibility necessary to maintain a reliable operation that meets consumer needs, and that also provides reserve pilots an opportunity for rest.

FAA interpretations have consistently stated that if the time between notification for a flight assignment and reporting for duty were of sufficient length to meet existing rest requirements, then that period would qualify as an opportunity for rest. The ATA

Air Transport Association of America
1301 Pennsylvania Ave., NW - Suite 1100 Washington, DC 20004-1707
(202) 626-4000

proposal includes a provision that provides the pilot with a minimum ten-hour advance notification. Once notified, the pilot would be free from reserve status and all responsibility for work. Notification under the advance notice concept would permit the pilot to be utilized for any legal flight assignment because the pilot has an opportunity for full rest prior to reporting for the assignment.

It is worth noting that the advance notice proposal is not without additional complexity or cost. As stated earlier, our members have indicated that that most reserve pilots will be provided with pre-scheduled or protected rest periods (PTP). A review of historical reserve utilization appears to support this hypothesis.

In order to provide a limit to the time, in which a pilot may be utilized in a specific reserve or duty assignment, a concept called Reserve Availability Period (RAP) is included in the ATA proposal. This limits the pilot's assignment to nineteen hours from the end of the previous protected rest period.

Note: The 19 hour proposed maximum Reserve Availability Period (RAP) is consistent with the 16 hour period between consecutive Protected Time Periods (PTP) plus the ability to reschedule the subsequent PTP by 3 hours. Any maximum PAP of less than 19 hours cannot be justified and will have considerable economic impact on operators.

In summary, the ATA Reserve Rest proposal satisfies the ARAC task assignment as it appeared in the July 9, Federal Register. Reserve pilots are provided with an opportunity for prospective rest that is not available to them under the current rule. This proposal also provides a solution to reserve rest that is consistent with a long list of FAA interpretations. In developing this proposal, ATA member airlines considered many factors including safety, effectiveness, flexibility, cost, administration, compliance and FAA enforcement.

Sincerely,

for:

Captain Paul Railsback
Chairman, ATA Reserve Rest
Task Force

Encl.

ARAC Reserve Duty and Rest Requirements Working Group

DEFINITIONS

The following definitions for ***rest*** and ***duty*** apply to Subparts Q, R, and S and are identical to existing definitions in Subpart P.

Duty Period - The period of elapsed time between reporting for an assignment involving flight time and release from that assignment by the certificate holder conducting domestic, flag or supplemental operations. The time is calculated using either Coordinated Universal Time or local time to reflect the total elapsed time.

Protected Time Period (PTP) - A period of time during a reserve assignment that provides a flight crewmember with an opportunity to rest. A certificate holder may not contact a flight crewmember during his or her PTP, and a crewmember may not have responsibility for work during his/her PTP.

Reserve Availability Period (RAP) - The period of time from the end of one protected time period to the time that the reserve flight crewmember must complete reserve or flight duty and start his/her next PTP.

Reserve Flight Crewmember - A flight crewmember that does not have a flight duty assignment and has a present responsibility for flight duty if called, but who is not on standby duty

Rest Period - The period free of all restraint or duty for a certificate holder conducting domestic, flag or supplemental operations and free of all responsibility for work or duty should the occasion arise.

Standby Duty – A period of time when a flight crewmember is required to report for a flight assignment in less than 1 hour from the time of notification. It also includes time when a flight crewmember is required to report to and remain at a specific facility (e.g. airport, crew lounge) designated by the certificate holder. Standby duty is considered part of a duty period. Standby duty ends when the flight crewmember is relieved from duty associated with an actual flight, or is otherwise relieved from duty.

RESERVE REST PROPOSAL

PART 121, SCHEDULED

Rest Period:

Each flight crewmember assigned to reserve duty will be provided with a scheduled rest period of at least eight consecutive hours during each reserve day, free of all duty with the carrier, so that the flight crewmember will have an opportunity to rest.

- The carrier may reschedule the rest period by as much as three hours earlier or later than the beginning time of the preceding rest period provided that notice is given prior to commencement of the next scheduled rest period.
- The carrier may reschedule the rest period with at least ten hours advance notice prior to the commencement of the next scheduled rest period.

Advance Notice:

Advance notice to a reserve flight crewmember of a flight assignment by the air carrier provides the flight crewmember an opportunity for rest.

- If the reserve flight crewmember is provided with 10 or more hours advance notice, that flight crewmember may be assigned any legal flight assignment.
- Contact may not be made with the reserve flight crewmember during a scheduled rest period for the purpose of providing advance notice.

Reserve Availability Period:

The Reserve Availability Period is the period of time from the end of the rest period to the time that the reserve flight crewmember must complete reserve or flight duty.

The reserve flight crewmember's reserve availability period may not exceed 19 hours except as permitted below. Actual flight duty time may be extended an additional two hours for reasons beyond the control of the air carrier such as weather, ATC, or mechanical delays. With advance notice of less than ten hours, the reserve availability period may be adjusted as follows, allowing for an opportunity for rest in preparation for the assignment:

- If at least 8 hours notice is given, the scheduled reserve availability period may not exceed 24 hours, except that the actual reserve availability period may be extended an additional 2 hours due to operational circumstances beyond the control of the operator.

- If at least 6 hours notice is given, the scheduled reserve availability period may not exceed 22 hours, except that the actual reserve availability period may be extended an additional 2 hours due to operational circumstances beyond the control of the operator.

- If at least 4 hours notice is given, the scheduled reserve availability period may not exceed 20 hours, except that the actual reserve availability period may be extended an additional 2 hours due to operational circumstances beyond the control of the operator.

The above reserve Availability Rules apply to international flights except where the reserve flight crewmember is assigned to an augmented crew, in which case, the flight and duty time rules of §121.483 and §121.485 apply for the entire flight duty assignment.

* * *

Attachment 2

Alternative Reserve Duty and Rest Proposal for Non-Scheduled Operations

(a) A certificate holder may apply the following reserve scheme for non-scheduled operations in lieu of the protected time reserve scheduling requirements for domestic or flag operations.

(b) Each flight crewmember must be given a 10-hour rest period before any reserve time assignment.

(c) If the reserve flight crewmember is provided with 10 or more hours advance notice, that flight crewmember may be assigned any legal flight assignment.

(d) The certificate holder may provide advance notice of an assignment to duty involving flight and provide an additional time of not less than one hour to report with the following limitations.

(1) If at least 8 hours advance notice is given, the scheduled duty period is limited to 12 hours, but may be extended to 14 hours for operational delays.

(2) If at least 6 hours notice is given, the scheduled duty period is limited to 10 hours, but may be extended to 12 for operational delays.

(3) If at least 4 hours notice is given, the scheduled duty period is limited to 8 hours, but may be extended to 10 for operational delays.

(4) If less than 4 hours notice is given, the scheduled duty period is limited to 7 hours, but may be extended to 8 for operational delays.

(e) The certificate holder must relieve the crewmember from all further responsibilities between advance notice and report time. [End]

Helicopter
Association
International

1635 Prince Street, Alexandria, Virginia 22314-2818 Telephone: (703) 683-4646 Fax: (703) 683-4745

January 14, 1999

Dr. H. Clayton Foushee
Vice President-Regulatory Affairs
Northwest Airlines
901 15th Street, NW, Suite 310
Washington, DC 20005

Re: *ARAC Flight Crew Reserve Time Working Group:*
HAI Proposal for a Rule Applicable to Part 135 On-Demand Air Charter

Dear Clay:

On August 5, 1998, FAA invited Helicopter Association International (HAI) to serve on a working group of the Aviation Rulemaking Advisory Committee (ARAC) to consider flight crew reserve time requirements. HAI herewith tenders its proposal for the structure and content of a Flight Crew Reserve Time regulation applicable to on-demand air charter operations conducted under 14 CFR Part 135.

HAI's proposal reflects many hours of thought, discussion and negotiation focused on optimizing flight safety, flight crew lifestyle concerns and operational flexibility in the context of the unique demands of Part 135 air charter operations. As you know, HAI fully supports the proposal for scheduled domestic operations conducted under 14 CFR Part 121 described elsewhere in your report. HAI believes that proposal is an appropriate balancing of concerns in Part 121 domestic scheduled air carrier operations. However, HAI also believes that the proposed Part 121 solution will not work in the Part 135 context, in particular because the advance notice provisions of the Part 121 proposal are inconsistent with the on-demand nature of part 135 air charter operations.

HAI also supports the substance of the "Special Provisions for Air Ambulance Operations" proposed by the National Air Transportation Association (NATA) and National Business Aviation Association (NBAA). However, we believe that the approach outlined there is appropriate for all part 135 on-demand air charter operations.

Finally, HAI thanks you and Dr. Don Hudson for your very capable, even-handed, and very patient leadership of the Working Group. Your efforts as co-chairs have been greatly appreciated.

Sincerely,

Roy Resavage
President

ARAC Flight Crew Reserve Time Working Group
HAI Proposal for a Rule Applicable to Part 135 On-Demand Air Charter

HAI proposes a rule on Part 135 Flight Crew Reserve Time structured in three parts:

1. **Scheduled Reserve**

Under 14 CFR part 135, an on-demand air charter operator may assign a pilot to "scheduled reserve."

- No period of scheduled reserve may exceed 14 hours in any 24 hour period.
- Each period of scheduled reserve must be preceded by a "protected time period" of at least 10 consecutive hours in length.
- No combination of "scheduled reserve" and assigned duty may exceed 20 consecutive hours.
- Under "scheduled reserve," the pilot's duty period begins when the pilot receives a call from the operator to report for work.

2. **Extended Reserve**

An operator may assign a qualifying pilot to a period of "extended reserve." Under extended reserve, a pilot may be assigned to hold herself:

- Able to be contacted by the operator;
- Remain fit to fly (to the extent that this is within the control of the pilot); and
- Remain within a reasonable response time of the aircraft,

all without triggering the start of any period of "duty" under the Part 135 flight crew duty time regulations.

a. <u>Duty under Extended Reserve</u>

- Under "extended reserve," the pilot's duty period begins when the pilot receives a call from the operator to report for work.
- When a pilot completes a period of duty under extended reserve, that pilot shall enter a protected time period of at least 10 consecutive hours before next being available for contact by the operator.

b. Limitation on Extended Reserve

- Assignment to extended reserve may not exceed 15 consecutive days.

- If assignment to extended reserve is for a period of not more than six consecutive days, the flight crew member shall enter a protected time period of at least 24 consecutive hours before next being available for contact by the operator.

- If assignment to extended reserve is for a period of more than six consecutive days, one additional period of 24 consecutive hours shall be added to the protected time period for each 3 days, or any portion of three days, of extended reserve assignment over six days.

3. **Operational Delay**

- The limitations stated in paragraphs 1 and 2 above may be extended by a maximum of 2 hours to meet operational delays.

- The limitations stated in paragraphs 1 and 2 above may be extended by air medical service operators as reasonable and necessary to complete a medical transport operation.

Attachment 4

NATIONAL AIR
TRANSPORTATION
ASSOCIATION

4226 King Street
Alexandria, Virginia 22302
(703) 845-9000 FAX (703) 845-8176

January 15, 1999

Mr. H. Clayton Foushee
Vice President, Regulatory Affairs
Northwest Airlines
901 15th Street, NW
Suite 310
Washington, DC 20005

Dear Clay,

Enclosed, you will find the National Air Transportation Association (NATA) and National Business Aviation Association (NBAA) proposal for the Aviation Rulemaking Advisory Committee Reserve Duty/Rest Working Group.

This concept paper reflects the issues unique to the on-demand air charter industry and explains the operator and pilot relationship where reserve concepts are concerned. While the proposal articulates the manner in which both NATA and NBAA believe reserve-related issues for Part 135 unscheduled operators should be handled, this proposal should not be viewed as suggested regulatory language. Please forward this proposal to the ARAC Executive Committee for submission to the Federal Aviation Administration.

Thank you for all your hard work as we addressed this complex issue.

Sincerely,

Andy Cebula

Andrew V. Cebula
Vice President

Enclosure
cc: Phil Harter, The Mediation Consortium

January 15, 1999

NATIONAL AIR TRANSPORTATION ASSOCIATION
&
NATIONAL BUSINESS AVIATION ASSOCIATION
PROPOSAL FOR RESERVE–RELATED ISSUES IN FAR PART 135 UNSCHEDULED OPERATORS

THE CONCEPT:

Under FAR Part 135, a flight crewmember's reserve issues consist of:

1. Rest
   - required rest (per current regulations)
2. Opportunity Time
   - can be contacted for a possible duty assignment
3. Duty
   - flying time
   - time required to prepare/conclude a flight
4. Standby
   - time required to wait for duty assignments

The purpose of this proposal is to define the elements of 'Standby' and 'Opportunity Time.' This clarification will provide the Part 135 certificate holder with the versatility to comply with the on-demand nature of unscheduled FAR Part 135 operations by having a pool of crewmembers who are on their own time, and free of all present duties of a certificate holder, unless the crewmember is contacted and the crewmember accepts a duty assignment. At the same time, this clarifies the crewmember's responsibilities to the Part 135 certificate holder and ensures adequate rest and fitness for duty assignments.

	OPPORTUNITY TIME	STANDBY	DUTY
What was the Previous Rest?	10 consecutive hours after a duty assignment	10 consecutive hours after a duty assignment	10 consecutive hours after a duty assignment
Is this Rest?	no	no	no
Is this Duty?	no	yes	yes
Can the Certificate Holder Contact Crewmember?	yes	yes	n/a
Is This Part of 14HR Duty Period?*	no	yes	yes

*SPECIAL PROVISIONS APPLY FOR AIR AMBULANCE FLIGHT OPERATIONS, SEE PAGE 3

PREVIOUS REST

Following a duty assignment, the crewmember must have received at least 10 consecutive hours of Rest before assignment to 'Opportunity,' 'Standby,' or 'Duty' can occur.

REST OR DUTY?

Opportunity Time: Opportunity time is not to be considered a duty assignment and does not fall under the duty time limitations. However, Opportunity Time is not Rest as defined by the regulations. It is an assignment unique to Part 135 unscheduled operators. When in Opportunity Time, the crewmember has no specific duties to the certificate holder until a duty assignment is accepted. Example of Opportunity Time: The certificate holder has no current duty or Standby assignment for the crewmember; however, should one arise, the certificate holder can contact the crewmember to determine if the crewmember can report for that duty.

Standby: Standby is considered a duty assignment. Upon being assigned to Standby, the 14-hour duty clock begins. This duty period ends when the crewmember is released by the certificate holder or the 14-hour duty period expires, whichever occurs first. Example of a Standby assignment: Crewmember is directed to wait at the airport for contact for a duty assignment and must report to that assignment within a reasonable time period.

Duty: Duty is the time a certificate holder has assigned a crewmember to specific duties and responsibilities. Duty time begins when a crewmember reports and ends when released or the duty period expires. Examples of duty are: flying, pre-flight and post-flight activities, training for the certificate holder.

OBLIGATION TO REPORT

Opportunity Time: During Opportunity Time, the flight crewmember has no specific duties to the certificate holder; however, the certificate holder can contact the flight crewmember for a duty assignment should one arise. There is a responsibility on the crewmember to be fit for a duty assignment unless the flight crewmember is not capable of accepting a duty assignment based on an inability to meet the following, for example:

- Adequately rested for the planned duty assignment,
- No immediate physical impediments that would affect ability to perform the duty assignment, i.e., sprained ankle or broken arm, etc.,
- Not being detrimentally affected by a major life stress, i.e. death in the family, or divorce, etc., that would affect ability to perform the duty assignment, and
- Ability to report for duty within a reasonable amount of time as defined by the certificate holder.

Standby: The duty period begins when Standby is assigned. A crewmember in Standby must be able to complete any duty assignment within the original duty period.

Duty: Reporting is not applicable as the crewmember is presently on duty.

PART OF DUTY PERIOD?

Opportunity Time: Opportunity Time is not considered part of the duty period and, therefore, does not count against the 14-hour duty clock.

Standby: This assignment is part of duty and can only continue for the duration of the normal duty period.

SPECIAL PROVISIONS FOR AIR AMBULANCE OPERATIONS

To accommodate the unique and critical flight operations conducted by Air Ambulance operators, these Part 135 on-demand air charter operators could operate under the following standby provisions without triggering duty time:

- an operator may contact the pilot for a duty assignment
- the pilot may be expected to remain fit for flight (to the extent that this is within the control of the pilot)
- the pilot may be expected to remain within a reasonable response time to the aircraft
- when operating under these provisions a duty period begins when the pilot is contacted and accepts an assignment

Such operations would be subject to the following constraints:

- following completion of a duty assigned during a period of extended reserve, the pilot will be provided at least 10 consecutive hours of rest before next being available for contact by the operator
- assignment to extended standby can consist of up to six consecutive days which shall be followed by a period of at least 24 hours of consecutive rest before next being available for contact by the operator
- Extension Provisions:
  The six-day period may be extended by the operator under the following conditions:
  1. Three additional days of extended standby may be assigned with the addition of another 24-hour period of rest.
  2. The maximum amount of extended standby will be 15 days followed by a mandatory 4 days of consecutive rest during which the operator may not contact the pilot.
- The duty period may be extended by Air Ambulance operators as reasonable and necessary to complete a medical transport operation.

Date: February 1, 1999

To: Air Carrier Operations Group

From: Donald E. Hudson, M.D.
Labor Co-Chairman ARAC Reserve Duty Working Group

It was my privilege to again serve as Co-Chairman of another ARAC Working Group, this time dealing with reserve rest issues for professional pilots. It was also rewarding to again work with Dr. Clay Foushee, with whom I shared office space at NASA Ames Research Center in the mid-1980's. In addition, Phil Harter did an admirable job moderating this sometimes contentious gathering.

The diversity of today's aviation environment was reflected in the representatives of the group and it was clear from the outset that there were a great variety of operational schemes in use for scheduling reserve pilots. Most of the meeting time was spent in attempting to reach agreement on a general scheme for Part 121 Scheduled Operators, it being felt that consensus was more probable in that arena. However, I was disappointed and dismayed that, once again, a general consensus in the ARAC between labor and management representatives proved elusive despite good faith efforts by many talented people on both sides of these issues.

At the first meeting, it was decided not to do a comprehensive review of the scientific literature on fatigue, despite the specific direction to do so in the Federal Register. The rationale at the time being that a detailed review of the scientific literature was unnecessary and, indeed, might be an actual impediment to reaching consensus recommendations. It was felt by both Dr. Foushee and myself that the two sides were not that far apart and a discussion of the operational fatigue research, especially that conducted over the last 15 years, would lead to disagreements over relatively minor points. In retrospect, that was a serious error. As the discussions continued into the fall of 1998, it became clear there were *fundamental* misunderstandings and differences of opinion about the research data and it's applicability to flight time/duty time regulations for pilots. This led to assertions that the scientific literature can be interpreted in a variety of equally plausible ways and was thus not very useful in providing guidance for drafting practical regulations. That conclusion is not shared by any of the reputable scientists who have conducted the operational research and it is not the view of the labor representatives nor the Battelle Group in their recent recommendations to FAA.

To their credit, the management group did acknowledge the need to provide an opportunity for a pilot to obtain 8 hours of sleep in a 24 four period but had great difficulty coming to terms with the physiological fact that *where* that opportunity occurs in the circadian cycle is as vital a parameter as the number of hours available. The research data indicates that humans show significant decrements in performance after prolonged periods of wakefulness. As we all know, commercial aviation can be a very unforgiving environment and this puts a heavy burden on FAA regulators who must try to ensure that safety is not unduly compromised.

The labor submission to ARAC is based on the available scientific data and research in this field – which continues in countries around the world. It is designed to make every effort to ensure that, as much as possible, only crewmembers with opportunity to receive adequate rest are available for duty. It is also designed to prohibit operations that have the real potential to push the human operators to fly when physiologically impaired. The scientific basis for these recommendations is referenced and included in the proposal. I would suggest the management side challenge themselves to similarly measure their proposal by the yardstick of the scientific data as well.

Any new regulations written to address the pressing issue of pilot fatigue *must* be based on our knowledge of the deleterious effects of fatigue on human physiology. The only constant in this discussion is the physiology of the human operator – the pilot. All other considerations, including economics and efficiency are important but not decisive.

It is discouraging to note that it is now 5 years to the day since the last ARAC Fatigue Working Group submitted it's proposals to FAA – and we still do not have a final rule on Flight Time Duty Time. New regulations dealing with Reserve Rest are a vital part of any new rulemaking process and I urge FAA to consider the various proposals and the available scientific data – and act swiftly to address this pressing problem.

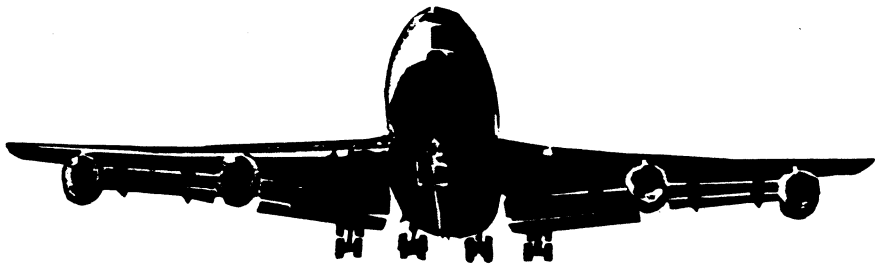
Donald E. Hudson

Donald E. Hudson, M.D.
ARAC RDWG Labor Co-Chairman

Aviation Rulemaking Advisory Committee
Reserve Rest Working Group

Proposal of 77,955 Airline Pilots
January 8, 1999

Airline	***Pilots***	***Airline***	***Pilots***
Air Wisconsin	240	Mesa	1095
Alaska	1153	Mesaba	804
Allegheny	354	Midway	174
Aloha	192	Midwest Express	262
Aloha Island Air	64	Northwest	6103
America West	1532	Piedmont	368
American	9508	Polar Air Cargo	186
American Eagle	2055	PSA	254
Atlantic Coast	694	Reeve	33
Atlantic Southeast	763	Reno	302
Business Express	372	Ross	19
Carnival	219	Ryan International	257
CCAir	172	Skyway	132
Comair	1000	Southwest	2735
Continental	4769	Spirit	154
Continental Express	1010	Sun Country	213
Delta	9188	Tower Air	206
DHL	395	Trans States	806
Emery Worldwide	451	TWA	2516
Express	329	United	9621
Federal Express	3611	UPS	2100
Hawaiian	285	USAirways	5092
IBT	6000	USAirways Shuttle	167



January 8, 1999

ARAC WORKING GROUP
PILOT MEMBERS SUBMISSION

VIA OVERNIGHT DELIVERY

Dr. Donald E. Hudson
Aviation Medicine Advisory Group
14707 East 2nd Avenue
Suite 200
Aurora, CO 80011

Dr. Clay Foushee
Northwest Airlines
901 15th Street, N.W.
Suite 310
Washington, DC 20005

Gentlemen:

The 78,000 airline pilots who were represented at the ARAC Working Group welcome the opportunity to provide their unified position regarding a reserve rest regulation. We are pleased that the Working Group was able to reach a consensus that pilots who are assigned reserve duty should have a protected rest period during every 24 hours. However, we are very disappointed that we were unable to reach a consensus as to the "scheme" that would best provide the required rest.

We believe that the efforts of the Working Group will prove helpful to the FAA in formulating a final regulation. The differing positions of the parties have been narrowed and clearly identified. It is now up to the FAA to timely promulgate a final regulation.

Respectfully submitted,

Captain Rich Rubin
Allied Pilots Association (APA)

Captain Frank Williamson
Air Line Pilots Association (ALPA)

Captain Robert Landa
Southwest Pilots Association (SWAPA)

Captain Don Kingery
Independent Association of Continental Pilots (IACP)

Captain Dave Wells
Fedex Pilots Association (FPA)

Lauri Esposito
Independent Pilots Association (IPA)

Don Treichler
International Brotherhood of Teamsters (IBT)

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A Scientific Review of Proposed Regulations Regarding Flight Crewmember Duty Period Limitations, Docket #28081, The Flight Duty Regulation Scientific Study Group ..... Appendix C

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AVIATION RULEMAKING ADVISORY COMMITTEE
RESERVE REST WORKING GROUP

PROPOSAL OF 77,955 AIRLINE PILOTS
January 8, 1999

PREAMBLE

This document is submitted on behalf of approximately 78,000 commercial airline pilots. The proposal that follows contains our recommendations for Federal Aviation Regulations concerning rest requirements and duty limitations for reserve pilots. It is applicable to all Domestic and International Part 121 operations under FAR Subparts Q, R, and S. Part 135 regulations should be revised to provide a level of safety equivalent to this proposal.

Our proposal is presented in two parts. Part I is the proposed regulatory language. Part II provides our intent, examples, and rationale. The scientific support for our proposal is included in the endnotes.

We are pleased that both pilots and air carriers were able to agree on the following elements of a proposed reserve rest rule:

1. A pilot should be scheduled by the operator to receive a protected time period as an opportunity to sleep for every day of reserve duty. The operator may not contact the pilot during this period.
2. An operator should limit the movement of a pilot's protected time period during consecutive days of reserve duty to ensure circadian stability.
3. A reserve pilot's availability for duty should be limited to prevent pilot fatigue as a result of lengthy periods of time-since-awake.

4. Sufficient advance notice of a flight assignment can provide a reserve pilot with a sleep opportunity.

We believe that it is incumbent upon the Federal Aviation Administration (FAA) to include time-of-day as a factor in designing duty and rest limitations. A substantial body of research and pilot reports shows that a decrease in performance frequently occurs during "back-side-of-the-clock" operations due to circadian factors. To address this issue, our proposal provides for a reduction in the reserve availability period when scheduled duty touches the 0200 – 0600 time period, or what the scientists refer to as the "window of circadian low."

Our submission refers to several documents that have provided us with a foundation of scientific support. Prominent among them is NASA Technical Memorandum 110404, *Principles and Guidelines for Duty and Rest Scheduling in Commercial Aviation,* (May 1996). This document, herein referred to as NASA TM, offers NASA's specific recommendations on duty and rest limitations based on more than 20 years of extensive research into the cause and prevention of pilot fatigue. It is attached hereto as Appendix A.

Another reference is *An Overview of the Scientific Literature Concerning Fatigue, Sleep, and the Circadian Cycle,* Battelle Memorial Institute Study (January 1998). This study, herein referred to as the Battelle Study, commissioned by the FAA's Office of the Chief Scientific and Technical Advisor for Human Factors, provides an in-depth review of scientific research concerning sleep and fatigue. Drawing upon 165 scientific references, the Battelle Report identifies major trends in the scientific literature, and has provided valuable information and conclusions. This study is attached as Appendix B.

Another reference is *A Scientific Review of Proposed Regulations Regarding Flight Crewmember Duty Period Limitations*, Docket #28081, The Flight Duty Regulation scientific Study Group. This study was sponsored by the Independent Pilots Association to provide a scientific review of NPRM 95-18. It is referred to as the Scientific Study Group and is attached as Appendix C.

The pilots met with sleep expert, Dr. William Dement, Director of Sleep Research and Clinical Programs at Stanford University. The transcript of that meeting appears in Appendix D.

We have attached an article titled *Fatigue, Alcohol, and Performance Impairment* that summarizes a study conducted by The Centre for Sleep Research at the Queen Elizabeth Hospital in South Australia in Appendix E. This study quantifies the performance impairment associated with sustained wakefulness in terms of equivalent percent blood alcohol impairment. A subsequent study, titled *Quantifying the Performance Impairment associated with Sustained Wakefulness,* by Lamond and Dawson replicates this study and extends the initial findings. It is attached as Appendix F.

The NTSB requested that the FAA conduct an expedited review of the FARs after pilot fatigue and continuous hours of wakefulness were found to be key findings in the crash of a DC-8 at Guantanamo Bay, Cuba in 1993. A NASA/NTSB report titled *Crew fatigue factors in the Guantanamo Bay aviation accident* is attached as Appendix G.

Several airlines have switched to reserve pilot schemes very similar to the one we propose. These carriers include Continental Airlines, UPS, America West, Alaska Airlines, and British Airways. The reserve pilots at these airlines have protected time periods of 8 to 12 hours with reserve availability periods of 14 to 18 hours.

We owe a debt of gratitude to the many pilots who provided us with reports of their encounters with pilot fatigue. These reports reveal that pilot fatigue typically occurs during back-side-of-the-clock operations and after long periods of time-since-awake.

The pilots would like to thank the FAA for providing this forum and the air carriers for contributing to the debate. We hope that this ARAC has demonstrated to all interested parties how unregulated scheduling can lead to dangerously high levels of pilot fatigue for reserve pilots. We urge the FAA to quickly remedy this very serious safety problem.

PART I: PROPOSED REGULATORY LANGUAGE

121.xxx Reserve Rest

(a) Except as provided in paragraphs (b) and (d), no certificate holder may schedule any flight crewmember and no flight crewmember may accept an assignment to reserve status unless a minimum prospective Protected Time Period (PTP) of 10 hours during a 24-consecutive hour period is scheduled. The Protected Time Period must begin at the same time during any scheduled period of consecutive days of reserve status and the flight crewmember must be given no less than 24 hours notice of the Protected Time Period.

(b) A certificate holder may reschedule a specific Protected Time Period during any scheduled period of consecutive days of reserve by the following:

(1) Rescheduling the beginning of a Protected Time Period a maximum of three hours later without prior notification.

(2) Rescheduling the beginning of a Protected Time Period a maximum of three hours earlier if the flight crewmember is provided 6 hours notice prior to the beginning of the originally scheduled Protected Time Period.

(3) Rescheduling the Protected Time Period by more than 3 hours once during any 7 consecutive days by providing the flight crewmember 10 hours notice.

(c) A certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying if such assignment is permitted by this subpart;

(1) If the assignment is scheduled to be completed within 16 hours after the end of the preceding Protected Time Period; however,

(2) If the flight crewmember is given a flight assignment for any part of the period of 0200 to 0600 hours, any such flight assignment must be scheduled to be completed within 14 hours after the end of the preceding Protected Time Period. The operator with the concurrence of the administrator and the pilot group may designate any 4-hour period for all operations between 0000-0600 hours in place of 0200-0600 hours.

These limitations may be extended up to 2 hours for operational delays.

(d) When there are no other reserve pilots who have sufficient reserve availability periods to complete an assignment, the certificate holder may schedule a flight crew member for an assignment for flight time in scheduled air transportation or other flying permitted by this subpart, provided that the crew member is given a minimum of 14 hours of advance notice and is released to protected time at the time of the notice.

(e) Each certificate holder shall prospectively relieve each flight crewmember assigned to reserve for at least 24 consecutive hours during any 7 consecutive days.

(f) For augmented International operations, a certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying as follows:

(1) For single augmentation, the assignment must be scheduled to be completed within 18 hours after the end of the preceding Protected Time Period; or

(2) For double augmentation, the assignment must be scheduled to be completed within 22 hours after the end of the preceding Protected Time Period.

These limitations may be extended up to 2 hours for operational delays.

DEFINITIONS

Operational Delay – Any delay that would cause the Reserve Crewmember to be extended beyond the applicable duty limit for up to two hours; except a delay caused by changing the Reserve's original flight assignment.

Protected Time Period (PTP) – Same as 121.471(b)(6), NPRM 95-18, except "has no responsibility for work" replaced by "has no responsibility for duty."

Reserve Availability Period (RAP) – The period of time from the end of the PTP to the time that the reserve crewmember must complete flight duty.

Reserve Time – Same as 121.471(b)(7), NPRM 95-18, except "two hours" for report time versus "one hour."

Standby Duty – Same as 121.47(b)(9), NPRM 95-18, except "less than two hours" to report versus "one hour."

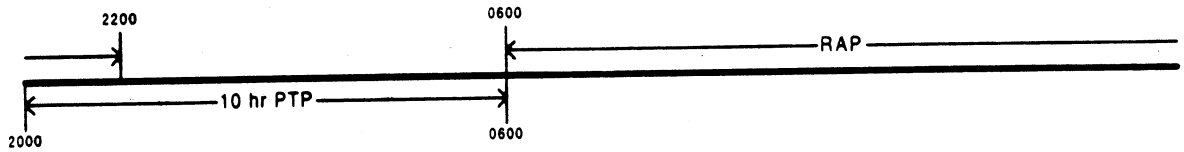
Part II: Pilots' Proposal with Intent, Examples, and Rationale

121.xxx ***Reserve Rest***

(a) ***Except as provided in paragraphs (b) and (d), no certificate holder may schedule any flight crewmember and no flight crewmember may accept an assignment to reserve status unless a minimum prospective Protected Time Period (PTP) of 10 hours during a 24-consecutive hour period is scheduled. The Protected Time Period must begin at the same time during any scheduled period of consecutive days of reserve status and the flight crewmember must be given no less than 24 hours notice of the Protected Time Period.***

Intent: To ensure that all reserve pilots are scheduled for and receive a prospective, and predictable, 10-hour opportunity every reserve day to obtain 8 hours of sleep and to maintain circadian stability.

Example:
Pilot - PTP 2000-0600



Rationale: The human body requires an average of 8 hours of uninterrupted, restorative sleep in a 24 hour period when sleeping during normal sleeping hours. When attempting to sleep outside of normal sleeping hours, 8 hours of sleep is still required. However, scientific data indicates additional time is needed to obtain the required 8 hours of sleep. The 10 hour Protected Time Period (PTP) would, therefore, include an opportunity to prepare for and actually receive 8 hours of restorative sleep in all circumstances. Additionally, a 10-hour PTP was selected with the assumption that the minimum required rest for all pilots would be 10 hours (See NPRM 95-18). A 10-hour PTP would maintain consistency of rest for all pilots. Starting consecutive PTPs at the same time is imperative to maintaining circadian stability. The desired method of assigning PTP would be when the crewmember is assigned reserve. A minimum of 24 hours notification of a Protected Time Period will provide an opportunity to prepare for impending reserve days. [1]

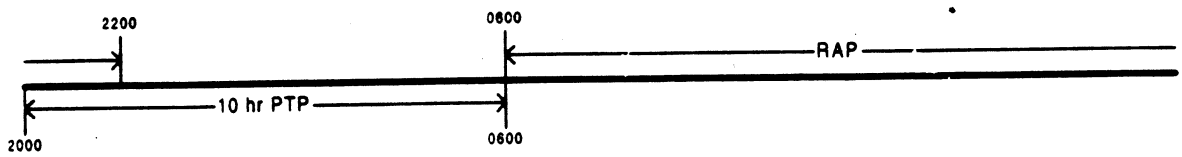
(b) ***A certificate holder may reschedule a Protected Time Period during any scheduled period of consecutive days of reserve by the following:***

Intent: To provide the reserve pilot with a predictable, prospective rest period and also give the operator scheduling flexibility to accommodate unforeseen circumstances. Rescheduling a PTP +/- 3 hours is only applicable to that PTP. Remaining reserve days in a block would begin at the original start time. Shifting of a PTP does not extend a Reserve Availability Period (RAP).

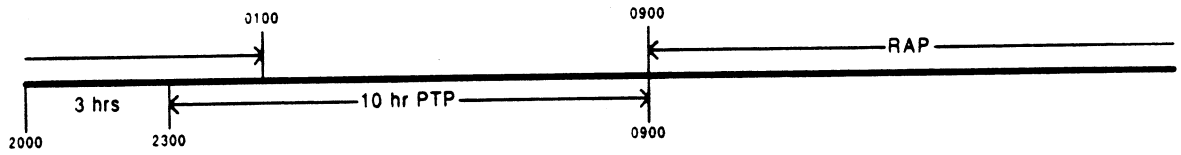
(1) ***Rescheduling the beginning of a Protected Time Period a maximum of three hours later without prior notification.***

Example:
(In this example, under no circumstances may a PTP start time be later than 2300)

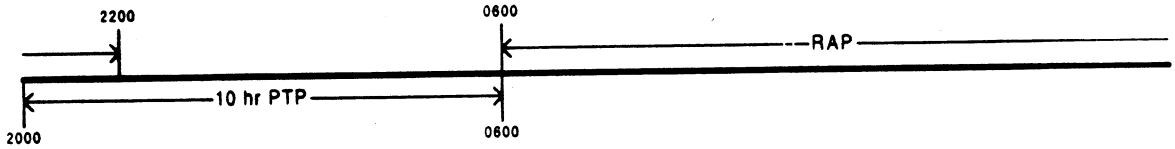
Day 1
PTP 2000 to 0600 (original PTP)



Day 2
PTP 2300 to 0900



Day 3
PTP 2000 to 0600

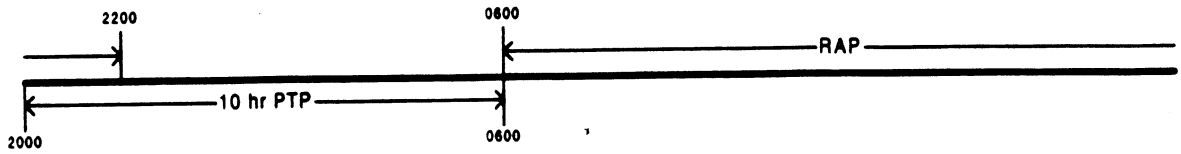


Rationale: Delaying a sleep opportunity, up to three hours, is not excessively disruptive to circadian stability. In this case, no prior notification is required.

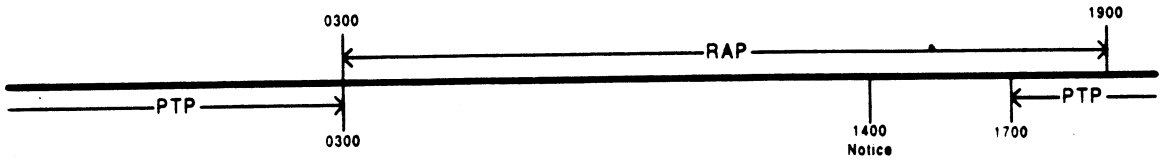
(2) ***Rescheduling the beginning of a Protected Time Period a maximum of 3 hours earlier if the flight crewmember is provided 6 hours notice prior to the beginning of the originally scheduled Protected Time Period.***

Example:
(In this example, under no circumstances may a PTP start time be earlier than 1700)

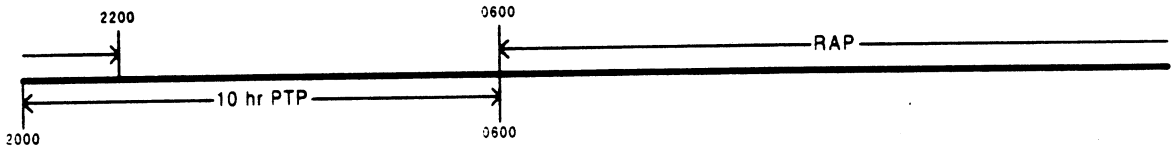
Day 1
PTP 2000 to 0600 (original PTP)



Day 2
PTP 1700 to 0300



Day 3
PTP 2000 to 0600



Rationale: Moving a sleep opportunity earlier, up to three hours, is disruptive to circadian stability. To accommodate and prepare for this rescheduled sleep opportunity additional notice is required.

(3) ***Rescheduling the Protected Time Period by more than 3 hours once during any 7 consecutive days by providing the flight crewmember 10 hours notice.***

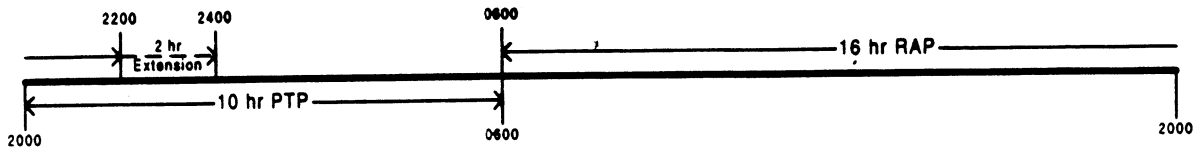
Rationale: Changing a sleep opportunity more than +/- 3 hours is very disruptive to circadian stability. For extreme circumstances beyond the control of the operator (i.e., inclement weather, closed airports, etc.) an operator has the ability to reschedule a PTP more than 3 hours from the original start time. A minimum of 10 hours prior notification of the new PTP is required to allow the pilot a period of time to adjust for the rescheduled sleep opportunity. This provision is restricted to once in every 7 days because it is so detrimental to circadian stability. This restriction also would preclude the operator from arbitrarily utilizing this provision and yet allows the certificate holder the flexibility to operate under extreme circumstances.[2]

(c) ***A certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying if such assignment is permitted by this subpart;***

(1) ***If the assignment is scheduled to be completed within 16 hours after the end of the preceding Protected Time Period;***

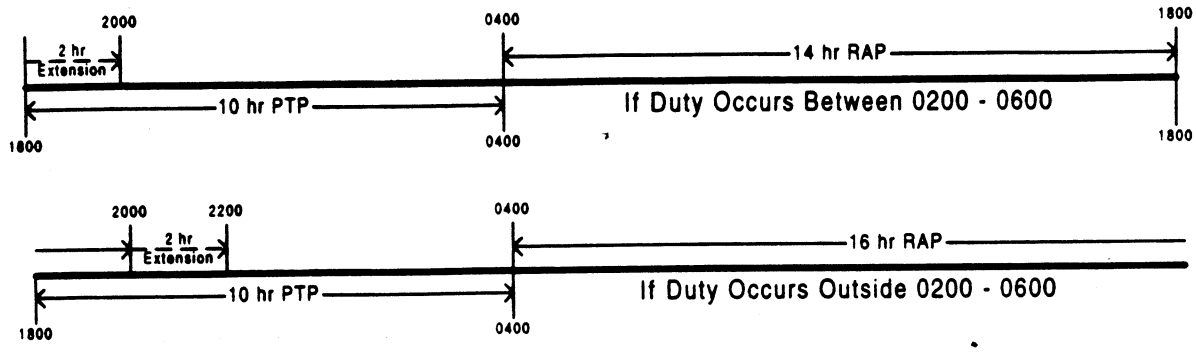
Intent: To establish a "Reserve Availability Period" (RAP).[3]

Example:



(2) ***If the flight crewmember is given a flight assignment for any part of the period of 0200 to 0600 hours, any such flight assignment must be scheduled to be completed within 14 hours after the end of the preceding Protected Time Period. The operator with the concurrence of the administrator and the pilot group may designate any 4-hour period for all operations between 0000-0600 hours in place of 0200-0600 hours.***

Examples:



These limitations may be extended up to 2 hours for operational delays.

Rationale: Time-since-awake contributes to fatigue. This section acknowledges time-since-awake by limiting the RAP to 16 hours if the pilot is afforded the opportunity to sleep during a normal sleep period. The science further indicates fatigue occurs sooner when given a sleep opportunity at a time other than normal sleeping hours. This section addresses that fact by reducing the RAP to 14 hours should duty occur during this normal sleep period.[4]

(d) ***When there are no other reserve pilots who have sufficient reserve availability periods to complete an assignment, the certificate holder may schedule a flight crew member for an assignment for flight time in scheduled air transportation or other flying permitted by this subpart, provided that the crew member is given a minimum of 14 hours of advance notice and is released to protected time at the time of the notice.***

Intent: All pilots are originally scheduled in a PTP system. Circadian stability is ensured by all pilots having a definitive, prospective sleep opportunity. When all such pilots have been utilized, 14 hours notice may be used by the operator to assign a pilot to a flight. Once notified of a flight assignment a crewmember is released from further responsibility until he reports for duty. While this method of assigning reserve is less than desirable, it enables the certificate holder to continue operations as necessary.

Rationale: While advance notice can present a sleep opportunity, scientific research is very clear that circadian factors make it very difficult and sometimes impossible to take advantage of it. For example, consider a pilot who finishes his PTP at 0800 and is then contacted by the carrier for an assignment that reports at 2200. This would be an application of 14 hours advance notice. Circadian factors make it very difficult, if not impossible, for the pilot to sleep again until later, typically during the afternoon circadian low point (1500 – 1800) or earlier if possible. However, by receiving the notice early, he can schedule his morning activity accordingly to best prepare himself for the afternoon sleep opportunity (like a line-holder does). Typically, he would go to bed around 1500 – 1600 and set the alarm clock for 1900 – 2000 to provide enough time to shower, dress, eat, and report for duty. Even with 14 hours of advance notice, this pilot could only expect to sleep 4 – 5 hours prior to reporting for a back-side-of-the-clock assignment that could last until 1200 the following day. It should be apparent that less than 14 hours notice could result in less than 4- 5 hours of sleep and raise the probability of serious pilot fatigue during the assignment.

The above example was discussed during the Denver ARAC meeting. At one point, Dr. Don Hudson was asked for his expert opinion regarding what should be required for a minimum amount of advance notice. Dr. Hudson's response was 13 to 14 hours.[5]

(e) ***Each certificate holder shall prospectively relieve each flight crewmember assigned to reserve for at least 24 consecutive hours during any 7 consecutive days.***

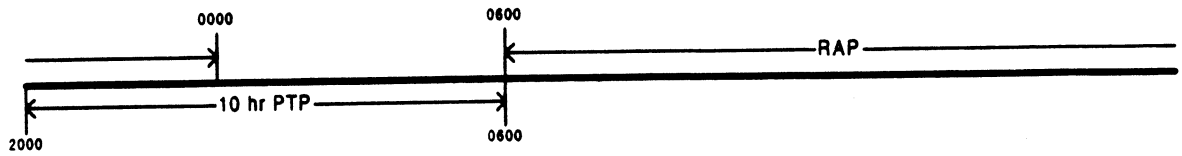
Intent: All reserve pilots must receive a prospective 24 hour period free from duty during any 7 consecutive days.

Rationale: Pilots assigned to reserve status must be continually prepared for any flight duty. These pilots should be relieved from this obligation for 24 hours during any 7 consecutive days. The pilot must be notified prior to the beginning of that off duty period.

(f) ***For augmented International operations, a certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying as follows:***

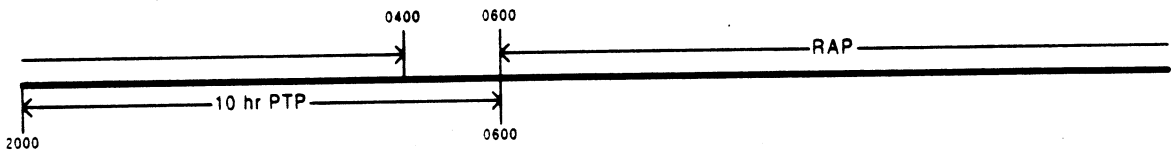
(1) ***For single augmentation, the assignment must be scheduled to be completed within 18 hours after the end of the preceding Protected Time Period; or***

Example:



(2) ***For double augmentation, the assignment must be scheduled to be completed within 22 hours after the end of the preceding Protected Time Period.***

Example:



These limitations may be extended up to 2 hours for operational delays.

Intent: To establish a Reserve Availability Period (RAP) for long-haul international reserve pilots.

Rationale: Long-haul international flights necessarily involve back-side-of-the-clock flying. Therefore, for a single pilot augmentation, we added 4 hours to the 14-hour back-side-of-the-clock duty period and 8 hours for double augmentation. This is in accord with the NASA TM. [6]

Scientific Support

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[1] ***121.xxx Reserve Rest***

(a) ***Except as provided in paragraphs (b) and (d), no certificate holder may schedule any flight crewmember and no flight crewmember may accept an assignment to reserve status unless a minimum prospective Protected Time Period (PTP) of 10 hours during a 24-consecutive hour period is scheduled. The Protected Time Period must begin at the same time during any scheduled period of consecutive days of reserve status and the flight crewmember must be given no less than 24 hours notice of the Protected Time Period.***

Scientific support:
(a) 10 hour Protected Time Period to provide an opportunity to obtain 8 hours of sleep.

> Each individual has a basic sleep requirement that provides for optimal levels of performance and physiological alertness during wakefulness. On average, this is 8 hours of sleep in a 24-hour period, with a range of sleep needs greater than and less than this amount. Losing as little as 2 hours of sleep will result in acute sleep loss, which will induce fatigue and degrade subsequent waking performance and alertness.

NASA TM, ¶1.1.1, p.2.

> **Off-duty period (acute sleep and awake-time-off requirements)** - Therefore, the off-duty period should be a minimum of 10 hours uninterrupted within any 24-hour period, to include an 8-hour sleep opportunity[.]

NASA TM, ¶2.1.2, p. 5

> Standard Sleep Requirements and Off-Duty Period - Research by Drs. Carskadon & Dement, 1982 and Wehr et al., 1993 support a minimum of 8 hours of sleep based upon a range of studies that use several approaches including:
>
> - Historical levels of sleep
> - Measures of daytime alertness
> - Sleep levels achieved when given the opportunity to sleep as long as desired

Battelle Report, p. 15.

> . . . There appears to be substantial evidence that a minimum of eight hours of sleep is required for most people to achieve effective levels of alertness and performance.

Battelle Report, p. 21.

. . . It is important to realize that an individual working nights is at risk for significant sleepiness for two distinct reasons: . . . an individual working successive nights is forced to obtain sleep during the daylight hours at a time when the circadian pre-disposition to sleep is minimal. . . . As mentioned, sleep under these circumstances is typically fragmented, sleep state architecture is distorted, and the restorative nature of sleep . . . is reduced.

A Scientific Review of Proposed Regulations Regarding Flight Crewmember Duty period Limitations, The Flight Duty Regulation Scientific Study Group, ¶2.6, p. 5-6.

Minimum rest periods should be adjusted upward for sleep periods that include the time of peak circadian alertness (4 – 6 PM.).

Reserve time arrangements should be adjusted so that protected windows during the time of peak circadian alertness are extended to compensate for decreased efficiency of sleep during that time. (Emphasis added.)

Scientific Study Group, ¶¶ 5.1.2, 5.1.4, p. 11.

Remarks of Dr. Dement:

Q: . . . One of the most basic tasks is for us to agree on a recommendation for a sleep opportunity . . . to afford every reserve pilot the opportunity of a protected time period so that he or she is absolutely insulated from contact from the operator. How many hours do you recommend for a minimum fixed sleep opportunity?

A: I will start out by assuming that we would take 8 hours of sleep as the most common requirement. Then you need to add to that in order to be able to get the proper amount of sleep. In your situation, I would think it would be a little larger than it might be for someone who really wasn't doing anything. So, I'd add a couple of hours to get the proper amount of sleep.

Appendix D, p. 4.

Q: Dr. Dement, . . . we're really at the point now where we're going beyond the philosophy and we're trying to put our finger on numeric values. Our position at least from the pilots' standpoint, is that we see the need for a 10-hour sleep opportunity knowing that the opportunity may not always be at the best time of the day. We're facing an industry position that is looking for 8 hours as the minimum. Our position is predicated on the fact that 8 hours may be adequate if it overlaps the WOCL. But since we don't know for sure when we're going to have that opportunity, we believe that, or we think that having that extra 2 hours is going to give us a little more of a buffer, especially when it comes during the daytime. Would you consider that to be a conservative and a justified position?

A: Absolutely. I don't think you could possibly assume someone is going to fall asleep instantly and then sleep continuously for 8 hours, not even under the most ideal circumstances. Maybe it should be longer.

Appendix D, pp. 5-6.

Scientific support:
(a) Scheduling the Protected Time Period for the same time each day

> **Time-of-day / Circadian Physiology Affects Sleep and Waking Performance** - . . . Time-of-day or circadian effects are important considerations in addressing 24 hour operational requirements because circadian rhythms do not adjust rapidly to change.
>
> . . . Thus, circadian disruption can lead to acute sleep deficits, cumulative sleep loss, decreases in performance and alertness, and various health problems . . . Therefore, circadian stability is another consideration in duty and rest scheduling.

NASA recommends a sleep opportunity that is predictable (24 hours notice recommended), <u>does not vary more than 3 hours on subsequent days to ensure circadian stability</u>, and is protected from interruption. (Emphasis added.)
NASA TM, ¶1.3, p. 3-4; ¶2.6.2, p. 8.

> **Conclusion** – Reserve assignments should attempt to maintain a consistent 24 hour cycle.

Battelle Report, p. 28.

<u>Remarks of Dr. Dement</u>

Q: Dr. Dement, there's one area that we really haven't touched upon at this point and I don't want to miss. These are questions regarding the maintenance of circadian stability. In your opinion, why is maintaining circadian stability so important?

A: Well because usually... and by that you mean your sleep opportunities and your wake opportunities are in that period of stability, then you have the best sleep and the best wake. If you get out of that cycle, then both sleep and wake will be impaired.

Q: What happens to the body as you change a person's cycle?

A: All sorts of things happen, but the major thing of course is that you are now trying to sleep when the body wants to be awake and you're trying to be awake when the body wants to be asleep because you left the circadian stability that you talked about.

Appendix D, pp. 16-17.

2 *(3)* ***Rescheduling the Protected Time Period by more than 3 hours once during any 7 consecutive days by providing the flight crewmember 10 hours notice.***

Scientific support:

(b) Limiting the movement of the Protected Time Period to Plus or Minus 3 hours

> . . . the 8-hour sleep opportunity should not vary by more than 3 hours on subsequent days to ensure circadian stability. . . .

NASA TM, ¶2.6.2, p. 8.

Remarks of Dr. Dement

Q: . . . we're trying to insure that the protected time period, the rest period, stayed the same from day to day, assuming the reserve crewmember is not called. Or for that matter when he is called, he goes back into his cycle. We're attempting to try to snap him back to as close to that original cycle and maintain that same rhythm from day to day. NASA has findings on that. Their recommendation was to maintain that circadian stability plus or minus 3 hours. Do you agree or disagree?

A: I absolutely agree that's better than no stability. Obviously the smaller that number, the better. I think practically it couldn't be zero, but I think we tend to feel there's kind of a daily flexibility within that range, like 0 to 3 hours, 0 to 2 hours. To go outside of that is, again, inviting a condition of sleep deprivation. So deliberately creating a bad situation.

Appendix D, pp. 16-17.

3 *(c)* ***A certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying if such assignment is permitted by this subpart;***

(1) ***If the assignment is scheduled to be completed within 16 hours after the end of the preceding Protected Time Period;***

Scientific support:

(c) 16 hour Reserve Availability Period Limitation

> **Continuous Hours of Wakefulness/Duty Can Affect Alertness and Performance** - Extended wakefulness and prolonged periods of continuous performance or vigilance will engender sleepiness and fatigue.
>
> **Extended flight duty period** – An extended flight duty period should be limited to 12 hours within a 24-hour period to be accompanied by additional restrictions and compensatory off-duty periods. This limit is based on scientific findings from a variety of sources, including data from aviation, that demonstrate a significant increased vulnerability to performance-impairing fatigue after 12 hours. It is readily acknowledged that in current practice, flight duty periods extend to 14 hours in regular operations. However, the available scientific data support a guideline different from current operational practice. The data indicate that performance-impairing fatigue does increase beyond the 12-hour limit and could reduce the safety margin.

NASA TM, ¶¶ 1.4, 2.3.4, pp. 4, 6.

NASA does not provide a specific recommendation for the duration of a Reserve Availability Period. However, it follows that NASA's recommended maximum duty limit of 12 hours plus 2 hours for operational delays (total - 14 hours) obviously requires a pilot to be awake at least that much time. By adding report time to NASA's recommended maximum duty limit, it is apparent that NASA's duty limit is commensurate with our proposed 16-hour reserve availability period limit for un-augmented flying.

> The results of an NTSB analysis of domestic air carrier accidents occurring from 1978 to 1990 suggest that time since awake (TSA) was the dominant fatigue-related factor in these accidents (NTSB, 1994). Performance decrements of high time-since-awake crews tended to result from ineffective decision-making rather than deterioration of aircraft handling skills. . . . There did appear to be two peaks in accidents: in the morning when time since awake is low and the crew has been on duty for about three to four hours, and when time-since-awake was high, above 13 hours. Similar accident peaks in other modes of transportation and industry have also been reported (Folkard, 1997). Akerstedt & Kecklund (1989) studied prior time awake (four to 12 hours) and found a strong correlation of accidents

> with time since awake for all times of the day. Belenky et al. (1994) found that flight time hours (workload) greatly increase and add to the linear decline in performance associated with time since awake.

Battelle Report, p. 13.

> Some symptoms of fatigue are similar to other physiological conditions. For example, with fatigue one's ability to attend to auxiliary tasks becomes more narrow, very much analogous to the effects of alcohol (Huntley et al., 1973; Moskowitz, 1973), hypoxia (McFarland 1953), and heat stress (Bursill, 1958).

Battelle Report, p. 5.

Australian researchers Drew Dawson and Kathryn Reid (1997) evaluated performance after 17 hours of wakefulness and found performance degraded to a level equal to that caused by a blood alcohol concentration (BAC) of 0.05 percent. At 24 hours, performance decrements were equivalent to that of a 0.10 BAC. After ten hours of sleeplessness, the decline in performance averaged .74 percent per hour. Their study titled *Fatigue, Alcohol and Performance Impairment* appeared in Nature, Vol. 338, July-August 1997. (See Appendix E). These findings were replicated and extended by Nichole Lamond and Drew Dawson in 1998. (See Appendix F).

> If an individual has been awake for 16 to 18 hours, decrements in alertness and performance are intensified. If time awake is extended to 20 to 24 hours, alertness can drop more than 40 percent (WRAIR, 1997; Morgan et al., 1974; Wehr, 1996).
>
> . . .

Battelle Report, p. 25.

The NTSB cited pilot fatigue as the probable cause of the crash of a DC-8 at Guantanamo Bay in 1993. The individual crewmembers were continuously awake for 19, 21, and 23.5 hours prior to the accident.
Mark R. Rosekind, et al., *Crew fatigue factors in the Guantanamo Bay aviation accident.* (See Appendix G).

Remarks of Dr. Dement

Q: Dr. Dement, after our reserve pilots receive their sleep opportunity, they become available for duty. We call the availability period the "reserve availability period" and that's basically the time they are available for work, for flying. After the sleep opportunity, what would you consider to be a safe limit of time since awake for a crewmember?

For the 10-hour (sleep opportunity) period?

Yes.

A: Fourteen hours. And I wouldn't say that's 100% safe but if you have a number, that adds up to the 24-hour day. It ought to be reasonably safe.

Q: Where do you get your number from?

A: Well, it comes mainly in my head from circadian type 24-hour studies to see the pattern of the manifestation of the drive to sleep versus the awakening effect of the biological clock. If you're getting outside the 24-hour cycle, then you're going to have periods of greater risk. . . .

Q: That assumes that the individual wakes up as soon as his protected time period is over. So in other words, you see a complimentary factor: 9 hours of rest should dictate a 15-hour availability period?

A: Yes. I think most people would agree that would be the ideal.

Q: Going beyond that, what is probably the most greatest points of contention right now – the debate between the pilots and the industry operators – is the fact that the operators would like to extend this reserve availability period in excess of what you say is 14 or 15 or 16 hours, whatever the case may be, to a larger increment, extending that reserve availability period based upon an advance notice of a nap opportunity. In other words, a pilot comes on call at 8:00 a.m. He is then told at 9:00 a.m. that he is to report for duty 5 hours later. The industry's position is that the notice constitutes an opportunity for additional rest which then would be utilized to add more restorative energy or analogous to putting more charge into a battery, and then carry that pilot into more of an extended duty period with an additional amount of time.... up to in certain cases 24 hours of duty. What is your feeling on that type of scenario?

A: To me, that's a recipe for disaster because if you have a responsible, professional pilot -- who has a reasonable schedule, - who is not horribly sleep deprived, and who has a fairly stable circadian rhythm, then the likelihood that he can get adequate sleep by trying to nap I think is relatively small. I would not depend on it at all. I would think also to have to do it sort of unexpectedly like this....Oh! Take a nap....Only people who are very sleep deprived....

Q: Let's say I have a 10-hour sleep opportunity: 10 p.m. to 8 a.m. That means I'm available for 14 hours unless they fly me into the next 10 p.m. slot tonight. Could I not get a call say at noon and say instead of you being off tonight at 10 p.m., we want you to work until seven tomorrow morning but you aren't going to go to work until 10:00 that night. So they call me at noon, they give a 10-hour notice that I'm not going to have to go to work until 10 hours from noon, so at 2200 I report for work, and they want me to fly until 0800. So that would be a total of 24 hours from the time I theoretically woke up and I've had a 10-hour notice that I was going to be flying this fatiguing schedule. Would that be safe?

A: Well, I wouldn't be on your plane. No. I think that's almost insanity in the sense of saying that is safe. First of all, naps can't be depended on – even under ideal circumstances – to get you through this period when the biological clock

alerting is gone, when you're alone with your sleep debt so to speak, during the WOCL. There's no way that isn't going to be dangerous. . . .

Appendix D, pp. 8-9.

(2) ***If the flight crewmember is given a flight assignment for any part of the period of 0200 to 0600 hours, any such flight assignment must be scheduled to be completed within 14 hours after the end of the preceding Protected Time Period. The operator with the concurrence of the administrator and the pilot group may designate any 4-hour period for all operations between 0000-0600 hours in place of 0200-0600 hours.***

Scientific support:

(c) Reducing the Reserve Availability Period by two hours during Back-Side-Of-The-Clock Operations (0200 – 0600)

> **Off-duty period (following standard flight duty periods during window of circadian low)** - Extensive scientific research, including aviation data, demonstrate that maintaining wakefulness during the window of circadian low is associated with higher levels of performance-impairing fatigue than during daytime wakefulness. . . .
>
> **Definition: "window of circadian low"** - The window of circadian low is best estimated by the hours between 0200 and 0600 for individuals adapted to a usual day-wake/night-sleep schedule. This estimate of the widow is calculated from scientific data on the circadian low of performance, alertness, subjective report (i.e. peak fatigue), and body temperature. . . .

NASA TM, ¶¶ 2.1.4, 2.3.2, pp. 5-6.

> The ingredient of day versus night long-haul flights raises a second concern, the time-of-day departure. Because sleepiness and fatigue are strongly related to circadian rhythmicity, they should not be controlled by regulations, which ignore time-of-day in favor of elapsed time. . . . For the sake of efficiency and safety, it is incumbent upon regulatory authorities to include time-of-day as a factor in designing flight crew duty and rest limitations.

R. Curtis Graeber, et al., *Aircrew Sleep and Fatigue in Long-Haul Flight Operations*, Tokyo, Japan (October 26-29, 1987), p. 13.

> **Back of the Clock Operations, Circadian Rhythm and Performance**
> There is a substantial body of research that shows decreased performance during night shifts as compared with day shifts. The reasons for this decreased performance include:
>
> - Circadian pressure to sleep when the individual is attempting to work.
> - Circadian pressure to be awake when the individual is attempting to sleep.
> - Time since awake may be substantial if the individual is up all day before reporting for the night shift.
> - Cumulative sleep debt increase throughout the shift.
>
> Research conducted by Monk et al. (1989) indicates that subjective alertness is under the control of the endogenous circadian pacemaker and one's sleep-wake cycle (time since awake). When time since awake is long and coincides with the

circadian low there is a very sharp drop in alertness, a strong tendency to sleep and a significant drop in performance (Perelli, 1980). Alertness is relatively high when the circadian rhythm is near the acrophase and time since awake is small. Monk (1996) argues that this cycle is consistent with the NTSB (1994) finding of a peak accident rate occurring in the evening. . . .

Battelle Report, p. 23.

Microsleeps have been shown to be a useful approach to assessing the effects of time of day on sleepiness levels. EEG brain wave changes confirm that pilots experience greater sleepiness and decreased alertness between 2:00 to 4:00 a.m. (Gundel, 1995). . . .

Battelle Report, p. 9.

. . . In determining maximum limits for extended duty periods, consideration also needs to be given to other fatigue-related factors that could contribute to excessive fatigue levels during extended duty periods, including number of legs, whether the flight impinges on the window of circadian low (WOCL), and time since awake. (Emphasis added.)

Battelle Report, p. 14.

Night operations are physiologically different than day operations due to circadian trough and sleep loss. This carries a higher physiological cost and imposes greater risks of accidents. One of the most established safety issues is working in the circadian trough between 0200 and 0600. During this period workers experience considerable sleepiness, slower response times, increased errors and accidents (Mitler, 1991; Pack, 1994). Many recent accidents from various transportation modes have been associated with this circadian trough (Lauber & Kayten, 1988). Lyman and Orlady (1981), in their analysis of the Aviation Safety Reporting System researcher state that 31 percent of incidents occurring between 2400 to 0600 hours were fatigue related.

In Japan, 82.4 percent of drowsiness-related near accidents in electric motor locomotive drivers (Kogi & Ohta, 1975) occur at night. Other landmark studies over the past several decades have documented the increase in accidents and error making. Klein et al. (1970) argue that their research with simulators proves that night flights are a greater risk than day flights. Their research found 75- to 100-percent mean performance efficiency decrements in simulator flights during the early morning hours, regardless of external factor such as darkness or increasing night traffic or possible weather conditions.

. . . A study of naval watch keepers found that between 0400 to 0600, response rates drop 33 percent, false reports rates 31 percent, and response speed eight percent, compared with rates between 2000 to 2200 hours (Smiley, 1996).

Samel et al. (1996) determined that many pilots begin night flights already having been awake more than 15 hours. The study confirms the occurrence of as many as five micro-sleeps per hour per pilot after five hours into a night flight. . . . The authors concluded that "During day time, fatigue-dependent vigilance decreases

with task duration, and fatigue becomes critical after 12 hours of constant work. During night hours fatigue increases faster with ongoing duty. This led to the conclusion that 10 hours of work should be the maximum for night flying."

[Note Samel's conclusion - Reduce the duty period from 12 to 10 hours.]

Gander et al. (1991) found in an air carrier setting that at least 11 percent of pilots studied fell asleep for an average of 46 minutes. Similarly, Luna et al. (1997) found that U.S. Air Force air traffic controller [sic] fell asleep an average of 55 minutes on night shift. A possible explanation for these sleep occurrences, in addition to circadian nadir, is the finding of Samel et al. that many pilots begin their night flights after being awake for as long as 15 hours.

Battelle Report, pp. 24-25.

Duty periods conducted during the WOCL already carry a fatigue penalty due to the circadian cycle. Consequently, duty periods involving WOCL should be reduced. (Emphasis added.)

Battelle Report, p. 28.

. . . flight duty regulations that adequately account for circadian modulation in the capacity of sleep and in human performance have been used in the United Kingdom for 6 years . . . and by account appear to be working well. The Study Group is aware of no qualitative reason why adjustments such as those incorporated in the UK regulations could not be used in the US as well.

Scientific Study Group, ¶4.2, p. 10.

Flight duty periods during window of circadian low.

. . . Therefore, it is recommended that in a 7-day period, there be no extended flight duty period that encroaches on any portion of the window of circadian low.

[Note: a standard flight duty period should not exceed 10 hours within a 24-hour period.]

NASA TM, ¶¶ 2.3.5.B.; 2.3.3.

5 ***(d) When there are no other reserve pilots who have sufficient reserve availability periods to complete an assignment, the certificate holder may schedule a flight crew member for an assignment for flight time in scheduled air transportation or other flying permitted by this subpart, provided that the crew member is given a minimum of 14 hours of advance notice and is released to protected time at the time of the notice.***

Scientific support:
(d) Minimum of 14 Hours Advance notice

> Considerable research into other arenas has taught us that individuals are better able to cope with unusual or extended duty schedules when they can plan for them in advance. This forewarning allows them to develop time-linked performance goals and to schedule their rest and activity optimally before reporting for duty.

R. Curtis Graeber, et al., *Aircrew Sleep and Fatigue in Long-Haul Flight Operations*, Tokyo, Japan (October 26-29, 1987), p. 12.

> ... In other words, simply being off duty was not a sufficient condition for crew members to be able to fall asleep. . . .

Philippa N. Gander, et al., *Crew Factors in Flight Operations: VIII. Factors Influencing Sleep Timing and Subjective Sleep Quality in Commercial Long-Haul Flight Crews* (December 1991), p. 29.

> . . . In the limited time remaining, he attempts to sleep irrespective of his physiological readiness to sleep (circadian phase) and the local time, both of which may compromise the quality and quantity of sleep he is able to obtain.

Philippa N. Gander, et al., *Crew Factors in Flight Operations: VIII. Factors Influencing Sleep Timing and Subjective Sleep Quality in Commercial Long-Haul Flight Crews* (December 1991), p. 31.

This reinforces the importance of ensuring that adequate time is available for sleep.

> **Conclusions – . . .** Flight and duty time regulations can be interpreted as a means of ensuring that reasonable minimum rest periods are respected. However, the perspective highlighted by this study is that the time available for sleep is less than the scheduled time off duty. . . .

Philippa N. Gander, et al., *Crew Factors in Flight Operations: VIII. Factors Influencing Sleep Timing and Subjective Sleep Quality in Commercial Long-Haul Flight Crews* (December 1991), p. 33.

Remarks of Dr. Dement

Q: How about that the flight is going to happen. There is going to be every day in America, pilots that report to work at 2300 or whatever and fly until 0800 the next morning. Now, what's different about the man who knows a week, a month in advance that this is going to be his schedule and the reserve pilot who finds out at noon after having woken up at 8 a.m.? What would be the difference?

A: You know that the time you do all of the things you can to move toward a better situation . . . You can never get to perfection, but the more practice, the more warning, the better you'll be able to handle it. Some people learn that there is a time when it's quiet and if I do this, I can pretty much depend that I will fall asleep. It's not 100% but you kind of learn that or you practice or whatever. But if it's without warning, all bets are off.

Q: Dr. Dement, you've kind of led the discussion into another area of this rulemaking that has to do with an alternative method. Assuming that the pilots in this protected time period method were depleted, the carriers then want to give pilots advance notice to cover any mission or any assignment. They are looking at 10 hours as the criteria. We don't believe that to be adequate based upon . . .

Are you talking 10-hour warning?

Ten-hour warning, yes. To do anything.

A: That would be 100% wrong.

Q: Why?

A: Well, because the 10 hours could fall sort of toward the beginning of what we call "clock dependent learning." There's no way you could sleep. And then you go into your duty period at the worse possible time you could have in that situation.

Q: What sort of time would you think would be adequate to give a guy enough time to get an opportunity to rest so that he would be safer than 10 hours?

A: Twenty-four hours. At least a day before. Wouldn't you think? I don't see how you can get notified as the day is beginning and feel you could depend on being able to take a nap. If it happened every day or somehow you know that you could certainly get the probability up, but it's not something that you could ever really control. Again, there ought to be a better way.

Appendix D, pp. 10-11.

Q: We're shooting around the subject. I hate to break any of this up, but this question has been plaguing this committee. The industry keeps harping on the fact that there should be no difference between the schedule holder who knows he's got to fly from midnight to 8:00 a.m. If he can do it safely, why can't a reserve that wakes up at the same time in the morning (8:00 a.m. or 6:00 a.m.). Why is it not safe for this reserve pilot who does it with notice?

A: I don't think it's safe for either pilot. Maybe a little less dangerous in the sense of performance, etc. But I think at least he has preparation, warning, etc. and knows his own strengths and weaknesses whereas the other pilot I think is always without warning and has really no chance to prepare. I don't think the two groups are the same.

Q: Are you implying that the preparation should actually start the previous night?

A: Yes. If I was going to drive all night, I wouldn't want someone to tell me that day.

Q: They're really killing us for making that same argument. I mean we make that argument across the table and we get smiles and nods of the head and shrugs of the shouiders from the other side. They say it's not a valid argument. That's always what they come up with.

A: They say it's not a valid argument? It is a supremely valid argument. I mean that's just like saying down is up.

Appendix D, p. 13.

6 *(f)* ***For augmented International operations, a certificate holder may assign a flight crewmember and a flight crewmember may accept an assignment for flight time in scheduled air transportation or other commercial flying as follows:***

(1) ***For single augmentation, the assignment must be scheduled to be completed within 18 hours after the end of the preceding Protected Time Period; or***

(2) ***For double augmentation, the assignment must be scheduled to be completed within 22 hours after the end of the preceding Protected Time Period.***

These limitations may be extended up to 2 hours for operational delays.

Scientific support:
(f) (1) and (2) augmented crews

Extended flight duty period: additional flight crew - Additional flight crew afford the opportunity for each flight crew member to reduce the time at the controls and provide for sleep during a flight duty period. Consequently, with additional flight crew and an opportunity for sleep, it would be expected that fatigue would accumulate more slowly. In such circumstances, flight duty periods can be increased beyond the recommended limit of 12 hours within each 24-hour period. For each additional flight crew member who rotates into the flight deck positions, the flight duty period can be extended by 4 hours as long as the following requirements are met: 1) each flight crew member be provided one or more on-duty sleep opportunities; and 2) when the extended flight duty period is 14 hours or longer, adequate sleep facilities (supine position) are provided that are separated and screened from the flight deck and passengers. Controlled rest on the flight deck is not a substitute for the sleep opportunities or facilities required for additional flight crew members.
NASA TM, ¶ 2.3.6, p. 7.

INTERNATIONAL
BROTHERHOOD OF TEAMSTERS
AFL-CIO

RAY W. BENNING, JR., Director
Airline Division
6242 Westchester Parkway, Suite 250
Los Angeles, CA 90045

TEL: (310) 645-9860
FAX: (310) 645-9869

January 6, 1999

Mr. Donald E. Hudson
Aviation Medical Advisory Group
14707 East 2nd Avenue
Suite 200
Aurora, CO 80011

Mr. Clay Foushee
Northwest Airlines
901 15th Street, NW
Suite 310
Washington, DC 20005

Gentlemen:

The undersigned (FPA, IACP, IPA, SWAPA, and IBT representing approximately 20,000 crewmembers) concur with the basic document submitted by the entire labor group concerning the issue of Reserve and Reserve Rest. This submission is supplementary to that document and it addresses additional methodology applicable to the Part 135 and non-scheduled carriers (non-scheduled as used herein applies to carriers currently operating under Part 121, Subpart S (supplemental rules) excluding such carriers as FEDEX, UPS, etc. that may operate under supplemental rules, but do so with a known published operating schedule).

It is recommended that the basic labor document, addressing a Protected Time Period (PTP) and Reserve Availability Period (RAP) methodology, apply to all carriers, i.e., scheduled, non-scheduled (as herein defined), and Part 135. Additionally, it is recommended that non-scheduled and Part 135 carriers be provided an alternative method for reserve assignments where it can be validated that the PTP-RAP methodology cannot be applied. An example requiring this alternative means would be an aircraft with one crew at a station with a prospective duty to operate the aircraft at an undetermined time.

The underlying rationale of the Flight and Duty Time ARAC working groups over the past seven years has been to ensure that crews are provided a reasonable sleep opportunity. The most effective means of rest is to provide a sleep opportunity at the same time each night. Recognizing that this is not always possible in the air transport industry, the PTP-RAP methodology and a reduced duty time, based on predetermined notice periods, represent two means of satisfying the underlying rationale of ensuring a reasonable sleep opportunity.

This alternative methodology greatly reduces the economic impact of regulatory reform on the non-scheduled and Part 135 segment of the air transport industry.

We believe that this submission should be helpful to the FAA in formulating a new rule that balances safety, economics, and the public interest. We are pleased that the FAA has addressed this issue and we are supportive of constructive change arising from the effort put forth by the respective groups and the Agency.

Dave Wells //s
FPA, CAPA

Lauri Esposito //s
IPA, CAPA

D.R. Treichler
IBT, CAPA

Bob Landa //s
SWAPA, CAPA

Don Kingery //s
IACP (non-CAPA)

PROPOSED REGULATORY LANGUAGE

121.xxx Alternative Means of Obtaining Reserve Rest for Non-scheduled Operators (without a known schedule) and Part 135 Operators (separate subpart)

(a) Non-scheduled operators and Part 135 operators may schedule a flight crewmember and that flight crewmember may accept a reserve assignment as follows:

(1) The operator first must assign a PTP period, discussed elsewhere in this rule, provided the operator's flight assignments have a known departure time (schedule), and the operator may then schedule and a crewmember may accept any assignment provided elsewhere in this rule excluding (2) and (3) below;

(2) If unable to comply with (1) above, and an advance notice before departure of not less than 14 hours is provided the crewmember, an operator may schedule and a crewmember may accept any assignment provided elsewhere in this rule excluding (3) below; or

(3) If unable to comply with (1) and (2) above, an operator may assign and a crewmember may accept a reduced duty period as set forth below:

(a) With 8 to 13:59 hours advance notice, the scheduled duty period is limited to 12 hours, but may be extended to 14 hours for operational delays; or

(b) With 6 to 7:59 hours advance notice, the scheduled duty period is limited to 10 hours, but may be extended to 12 hours for operational delays; or

(c) With 4 to 5:59 hours advance notice, the scheduled duty period is limited to 8 hours, but may be extended to 10 hours for operational delays; or

(d) With less than 4 hours advance notice, the scheduled duty period is limited to 7 hours, but may be extended 1 hour for operational delays.

(e) For assignments in paragraph (2) and (3) (a) through (d) above, the operator must relieve the crewmember from all further responsibilities between advance notice and report time.

(f) Advance notice, as used in paragraphs (a) through (d) above, means the time from when a crewmember is alerted for an assignment until transportation local in nature is available at that hotel to transport that crewmember to his place of assignment. The duty period thereby commences with hotel pick up.

Appendix I

Reference Data Furnished by the IBT

1. Normal daily sleep - References vary from 7 hours and 20 minutes to approximately 8 hours and 10 minutes.

Coren, S., *Sleep Thieves,* (Toronto: Free Press, 1996) pp. 251-253
(7 to 8 hours and 10 minutes.)

Dinges, D. and R. Broughton, *Sleep and alertness: Chronobiological, behavioral and medical aspects of napping,* (New York: Raven Press, 1989)
(Average sleep for N. American and European adults were around 7 hours and 20 minutes.)

Wojtczak-Jaroszowa, J., *Physiological and Psychological Aspects of Night and Shift Work,* USDEW (NIOSH) 1977
("During normal night sleep, lasting about 7½ hours....")

2. Napping –

Op. Cit., Coren, S., pp. 222-223
(Naps before and during a shift have shown "modest success.")

Nicholson, A. and B. Stone, *Circadian Rhythms and Disturbed Sleep: Its Relevance to Transport Operations,* IJAS 1/3-D (Unknown publication date in approximately 1982
("...naps, sleeps of 3-4 hours and very long periods of sleep are all attempts to adapt to the irregularity of duty hours and time zone changes, and to ensure adequate rest before the next duty period. It would be reasonable to assume that the natural requirements for sleep are met in this way-even though the timing and duration of the sleep periods are radically changed.")

Nicholson, A., *Sleep and Wakefulness of the Airline Pilot,* Stewart Memorial Lecture presented February 11, 1986 at the Royal Aeronautical Society
("...with a 4 hour period of sleep during the evening, there was a sustained improvement in performance overnight" ....."...recent studies show how (*naps*) can improve alertness...There was a distinct improvement in their alertness during the day when a nap of 1 hour was taken in the morning. The effect was evident in the afternoon, as the nap seemed to encourage the rise in alertness, which normally occurs during the day. The duration of a nap may be critical if it is to be beneficial, and its effects may last for several hours.")