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## **PART 1 - PHILOSOPHY OF STUDY AND SELECTION OF PARTICIPANTS**

### **Background**

Long-range augmented crew operations create challenges to safety and pilot proficiency. Pilot proficiency is complex and multifaceted and includes:

- Issues of crews operating long-duration flights with few takeoffs and landings
- The relationship between intervals of training and pilot proficiency
- Quality of flight training
- Scheduling practices as they relate to frequency of performance of critical skills and crew fatigue
- Pilot experience
- The relationship between pilot currency and proficiency in the aircraft

Pilot proficiency goes beyond the challenges of the augmented crew and applies to pilots in all types of operations. However, this study focuses primarily on the proficiency issues associated with pilots on augmented crews who predominantly fly long-duration flights.

As a result of an incident that raised concerns over pilot proficiency and thus the safety of United Airlines' dual-augmented operations, the FAA required a study of pilot proficiency and safety issues. This study is the result of the FAA requirement and was conducted as a joint United Airlines (UAL) and Air Line Pilots Association (ALPA) effort. The Crew Augmentation Study Team was formed to complete the study. The team is comprised of equal numbers of members representing United Airlines and ALPA. The current team is the third group to work on this project. For various reasons, the previous two groups were unable to complete this study. This team expanded on work started by the previous groups.

### **Purpose**

The purpose of this joint study was to investigate various augmentation systems and identify ways to improve proficiency and safety. To accomplish this, the team studied how different airlines implement their dual-augmentation systems and examined the relationships between their training programs, scheduling practices, frequency of performance of critical skills, fatigue, and other factors. This study followed the guidelines defined in the "Letter of Understanding Between United Airlines and the Air Line Pilots Association Regarding The Crew Augmentation Study and Related Crew Augmentation Issues", dated August 30, 1999. Based on this letter of understanding, this study

- included all known methods of augmentation
- assumed that proficiency concerns are complex and that increasing the number of landings will not necessarily increase pilot proficiency
- factually models pilot proficiency as a total system rather than individual proficiency components
- recommends solutions to enhance proficiency; not treat the symptoms.

## Scope

The Crew Augmentation Study Team defined the scope of the study as:

**The study of airlines using long-range aircraft with a two-person flight deck staffed with at least two additional flight deck crewmembers in regular, scheduled commercial passenger or cargo service.**

As a result, this study concentrated on dual-augmented operations to consider the most restrictive case. The team felt that proficiency and augmentation strategies to enhance pilot proficiency for dual-augmented crews could be adapted to single and non-augmented operations.

## A Word of Thanks

The team would like to thank the airlines and their staff who took part in our telephone surveys and our on-site visits. Without their help and cooperation, this study would have been much more difficult. We would also like to thank Dr. Immanuel Barshi from NASA Laboratory at Ames, California and Dr. Tom Seamster, the head of “Cognitive and Human Factors,” Sante Fe, New Mexico for their advice and help.

## Method of Study

The Crew Augmentation Study was conducted as a scientifically disciplined effort. Because the team had limited time and resources available for the study, a true scientific study was not possible. However, according to Dr. Barshi of NASA, a credible and valid study could be conducted by substituting certain assumptions for certain areas of research. As long as the assumptions made were based on the reasonable judgment of experienced pilots, Dr. Barshi feels the assumptions should be able to withstand reasonable scrutiny to anyone who examines the study.

The study was conducted in 5 phases:

1. Developing the proficiency model
2. Selection of carriers for study
3. Selection of carriers for on-site visits
4. On-site Carrier visits
5. Conclusions and Recommendations

The first three phases are described in Part 1 of this report. Part 2 contains the findings from our on-site visits to the various airlines. Part 3 contains our conclusions and recommendations.

## Developing the Proficiency Model

In order to understand pilot proficiency, one must first define proficiency and the factors that affect pilot proficiency. The team used a “Profile of Pilot Proficiency” model which was originally developed by a detailed study group consisting of United Airlines representatives from the Pilot Enhancement Program, the Quality Assurance Office, and the ALPA UAL-MEC Training Committee. The Crew Augmentation Study Team refined this model, adding and expanding categories that affect proficiency.

The final model used for this study was called “Profile of Proficiency” and contained eleven categories that affect proficiency (See Attachment A). These categories, which are listed in no particular order, are:

- Physiological
- Performance Orientation
- Experience
- Motivation
- Assigned Crew Duties
- Aircrew Management
- Performance Failure
- Practice
- Training
- Emotional
- Personality

The team identified the “Emotional” and “Personality” categories from the model as inappropriate for inclusion in the study because of their sensitive nature and the difficulty involved in trying to collect data. The team used this model to develop the criteria for selecting the carriers for the in-depth interview process, to develop the questions for the initial survey and telephone interview, and to develop questions for our on-site interviews.

### **Selection of Carriers**

The Crew Augmentation Study Team compiled a list of all possible dual-augmenting carriers from the August 1998 OAG database. The team initially included airlines irrespective of the number of flights or hours flown, the composition of their augmented crews, or the type of aircraft flown in augmented operations.

From this list, the team identified 59 international carriers for inclusion in the study. Two criteria were identified to exclude carriers that did not meet the scope of the study. These criteria were:

- The airline must average at least one flight per day over 12 hours block time
- The airline must augment with two additional pilots on a two-pilot aircraft

After applying the above criteria to the August 1998 OAG database, 31 carriers were chosen for the study. A list of these carriers is shown in Attachment B.

### **Selection of Carriers for On-site Visits**

Since the team could not visit 31 carriers, a method was needed to pare the list to a reasonable number. The team developed four criteria to select the carriers to visit. The criteria chosen filtered the airlines based upon size of their dual-augmented operation, the differences from United Airlines’ operations, and finally the differences from other carriers selected up to that point. A thorough discussion of each criterion and the results of the filtering process follow.

#### **Criterion 1 – Select the top two carriers based on the largest amount of weekly flight hours, for flight segments over 12 hours**

These carriers should be closest in size to United’s dual-augmented fleet and pilot population. This criterion is used to identify airlines that may have the same proficiency problems as United Airlines.

From the August 1998 OAG data, the carriers ranked in order of weekly flight hours over 12 hours block are:

<u>Airlines</u>	<u>Weekly Hours</u>
Singapore Airlines	265
United Airlines	229
British Airways	185
Cathay Pacific Airways	176
Northwest Airlines	151
Air France	123

From the list above, **Singapore Airlines** and **British Airways** meet the criterion.

**Criterion 2 – If a U.S. carrier is not chosen from Criterion 1, select a carrier from the United States that flies the most weekly dual-augmented hours**

Since this United States carrier must follow the same FARs as UAL, they may also have similar problems to overcome.

From the list above, **Northwest Airlines** meets the criterion.

**Criterion 3 – Select a carrier whose operations differ the most from United Airlines**

Airlines that conduct operations differently from UAL are needed to provide a different perspective and get new ideas on implementing augmentation systems. To determine airlines that provide the most differences from United Airlines, the team developed the following questions from the categories contained in the “Profile of Proficiency.”

1. How is command defined with respect to your dual-augmentation system?
2. How often and of what duration is your recurrent training program?
3. Does your company have a formal or informal landing assignment program?
4. Does your company have a formal program to incorporate circadian rhythm into pilot’s schedules or do you authorize cockpit napping?
5. Does your company have a program to provide assistance for pilots who have proficiency or training problems?
6. Does your company use the simulator and/or aircraft to help pilots maintain currency or proficiency?
7. What other devices does your company use to help pilots maintain currency or proficiency?
8. Has your airline made any substantial changes to the way you manage your augmented crews?
9. For each crew position, how many years, on average, have your pilots worked for your airline?

These questions were ranked, as shown, by order of importance for our decision rule of selecting the carrier with the most differences from UAL. Lower-level questions were developed for each of the main questions to help ensure the desired information was received. All questions were mailed to the 31 carriers in the form of a written survey. Follow-up telephone interviews were conducted to gather additional information and verify information returned on the surveys. The initial survey is shown in attachment C. The surveys included questions on long-range augmentation systems, training issues, pilot proficiency issues, and scheduling techniques. To ensure the survey was fully answered and responses fully understood, additional clarifying questions were formulated and used during the telephone survey.

The written surveys and follow-up phone interviews were conducted in November and December of 1999. Twenty-nine of the 31 carriers cooperated with the study. Aircraft used by the carriers surveyed include the B747-400 (744), B777, A340, and MD-11. The findings from the survey and telephone interviews are contained in the report in Attachment D.

A decision matrix and the information gathered from the surveys and telephone interviews were used to apply Criterion 3. **Lufthansa Airlines** met the criterion the best.

**Criterion 4 – Select the carriers whose operations differ the most from the carriers already selected**

The same decision matrix used in Criterion 3 was applied, but now comparing differences from the previously selected carriers, instead of differences from United Airlines as the decision rule. The carrier selected was added to the list of previously selected carriers and Criterion 4 was reapplied to the new list. This process continued until at least one carrier from each type of augmentation system was selected.

**KLM Royal Dutch Airlines, Air France, and Qantas Airways** were selected using Criterion 4.

Based on the four criteria, seven airlines were selected for on-site visits. At least one airline from each augmentation type was selected as shown in Attachment E. In other words, the seven airlines selected represent the following dual-augmentation systems:

- Two Captains and two First Officers (2 + 2)
- One Captain and three First Officers (1 + 3)
- One Captain, two First Officers, and one Relief Pilot (1 + 2 + 1)
- One Captain, one First Officer, and two Relief Pilots (1 + 1 + 2)

We did not select an airline to visit that uses dual-qualified pilots in their augmentation system because of errors that occurred during the telephone interviews. Because of time and manpower constraints, the team was not able to start over. We compensated for this oversight by conducting extensive telephone interviews with management pilots from the appropriate airlines. The conclusions and recommendations of the study were not affected.

## Conclusion From Surveys

### Currency Does Not Equate To Proficiency

During the progress of the study, the committee realized the factors that affect pilot proficiency are very complex, and that *simply maintaining landing currency (three takeoff and landings in 90 days) on an airplane does not mean a pilot is proficient*. While frequency of landings does not necessarily equate to proficiency, it has historically been a convenient and easily tracked unit of measure to reflect proficiency and is used industry-wide.

Our “Profile of Proficiency” model (Attachment A) shows that many factors can actually affect a pilot’s proficiency. We conclude that the proficiency of a pilot should be defined not only by how well the pilot performs landings, but also include such things as standard operating procedures, pilot not flying (PNF) duties, terminal area operations, and CDU programming. Performing PNF duties from the right seat enhances proficiency of First Officers in the terminal area. This includes tuning the radios, building FMS approaches, practice in situational awareness, and participating in decision-making processes that cannot be practiced when acting as a relief pilot.

*Our experience indicates that pilot proficiency is defined not only by how well the pilot manipulates the controls, but also by how well the pilot interfaces with the automation in the role as both the pilot flying (PF) and the PNF. This is especially true in highly automated aircraft.* The proficiency and experience gained in performing PNF duties on highly automated aircraft, we believe, has a direct, positive correlation on a pilot’s proficiency in performing PF duties.

In a significant departure from the way currency is presently defined, we conclude that the measure of a pilot’s proficiency should include maintaining currency in both PF and PNF duties. The committee believes there is a direct relationship between how often PF and PNF duties are performed and the proficiency of the pilot in performing these duties. This concept will be used to help define the practice category of our proficiency model for the remainder of this report. The committee believes that the concept of currency should be redefined to more closely reflect proficiency in both PF and PNF duties. One of our recommendations to the FAA and UAL in December 1999 reflects this conviction and concluded that PNF duties should be included in the recency requirements for UAL.

## PART 2 - RESULTS OF CARRIER VISITS

The “Profile of Proficiency” model was used for developing detailed questions for the on-site visits. To allow the carriers to prepare for our visit, the team developed a proficiency question overview that was sent to each carrier prior to the visit. This overview is shown in attachment F.

To help ensure the information gathered from each airline was accurate and unbiased, the team interviewed members from airline management, the pilot union, and line pilots. The findings from interviews, company manuals, and official company documents are included in each individual airline report. The reports are organized according to our “Profile of Proficiency” model in order to make information affecting pilot proficiency easy to locate. For the individual airline reports, we combined the “Motivation” and “Performance Orientation” categories into a single category called “Motivation and Pilot Focus.” More information was gathered than was strictly necessary to evaluate pilot proficiency so that a complete picture of the operation of an airline’s augmentation system and the relationship between factors affecting its operation could be determined.

After the individual airline reports were written, we provided an opportunity for the groups interviewed at each airline to verify the information by allowing them to preview and correct any inaccuracies. All of the facts represented in the individual airline reports will be used exclusively for this study. However, in some cases, the facts may not represent the official view of the air carrier, their pilot group, or their union. The results of the visits are contained in the individual airline reports that can be found on the following pages:

<u>Carrier</u>	<u>Page</u>
Air France	8
British Airways	14
KLM Royal Dutch Airlines	20
Lufthansa	26
Northwest Airlines	33
Qantas Airways	39
Singapore Airlines	47
United Airlines	53



The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## AIR FRANCE

Air France dual-augments on the 744 and 777 aircraft, and seasonally on the A340. They have thirteen 744 aircraft, crewed by approximately 120 Captains and 200 First Officers. They have approximately 75 Captains and 130 First Officers flying eight 777 aircraft. They also have 16 A340 aircraft flown by approximately 160 Captains and 210 First Officers. Air France has a single pilot domicile at Paris Charles de Gaulle Airport. They single-augment with an additional First Officer and dual-augment with two additional First Officers.

Air France dual-augments Paris - Singapore and Paris - Buenos Aires routes with the 777, the Paris - Narita route on the 744, and the Paris - Singapore with the A340. Most of their flying on the 744 and 777 aircraft is flown single or non-augmented.

Operations are conducted under the regulations of the European Joint Aviation Authority (JAA) and their civil authority. The regulator requires 3 takeoffs and landings in a 90-day period for both Captains and First Officers. Joint Aviation Regulations (JARs) will soon require First Officers to accomplish one takeoff and landing every 90 days, but French regulations still require three. Air France requires one of the three landings be in the airplane. All Captains and First Officers have an ATPL and are type rated on the aircraft. Captains maintain landing currency in the left seat and First Officers maintain landing currency in the right seat.

### Aircrew Management

#### Staffing

Air France hires mostly *ab initio* pilots that come from the France state school. Newly hired pilots initial aircraft assignment is either as a 737 or A320 First Officer. They hold this position for about 3 years (based on openings) when they can choose, if desired, to fly First Officer on the 747-200, 767, or A340. They are normally only allowed to fly one of these three airplanes. New aircraft bids are awarded based on seniority. When openings exist, they can bid to fly First Officer on the 744. First Officers may bid Captain on any aircraft when they wish (and have the seniority to hold Captain on a specific aircraft) or may remain as First Officer. There is no requirement to bid Captain when it is available. Most 744 First Officers wait for a 767 Captain position to upgrade. Pilot salary is paid to equipment and is based on aircraft speed and weight. Pilots receive 40 days of vacation per year with a minimum of 14 days at a time. There is a provision allowing pilots to work part time. Pilots retire at age 60.

Three years ago, Air France conducted a study of augmentation systems and decided to retain their system. They believe the single Captain system is better for Air France from a legal standpoint and best suits what they refer to as their "Latin culture". From a legal aspect, the Captain is responsible for dispatching the flight and only he can determine the route and final fuel load. French law does not require dispatchers. To avoid CRM problems if they used two Captains, they felt they would need a clear definition of the roles of each Captain and how they would operate on the same crew.

A pilot union representative said they do not accept the cruise relief pilot (CRP) concept. They felt that trust for a CRP is a problem since CRPs are minimally qualified on the hardest routes. Also, rest for the Captain would be a problem with a CRP in the control seat. They felt the Captain could have much greater confidence in two First Officers on the flight deck rather than an experienced First Officer and a less experienced, limited qualified CRP. The representative said the union did not like the concept of a dual 320/340 qualification because the pay scales of the two aircraft are different. Problems could also be caused by mixing the mindset of the pilots between short-range and long-range flying. Several Captains interviewed like the augmentation system of

two Captains and two First Officers. They thought it maintained a more serious crew climate and presented a safer flying operation.

Air France decided not to have a senior First Officer (SFO) position because they consider their First Officers to have the same experience level as a SFO. They believe this because all their First Officers receive the same training as a Captain, they are type-rated, and they do not allow two inexperienced First Officers to fly together.

### Scheduling

In general, both flight time and duty time limitations for each crew size is a function of the number of sectors in a day and the departure time. A basic crew has a maximum scheduled flight time between 9 hours and 10 hours and a scheduled duty time maximum between 12 hours and 14 hours. A single-augmented crew has a maximum scheduled flight time between 9 hours and 13 hours 30 minutes and have a maximum scheduled duty time range of between 13 hours and 16 hours 30 minutes. A single-augmented crew is also restricted to a maximum of two sectors per day. Dual-augmented crews are restricted to one sector per day and have a maximum scheduled flight time of 14 hours. Their maximum scheduled duty time is 18 hours. Dual-augmentation time maximums are not affected by departure time. Contract rules require that they augment both directions of a pairing sequence even if only one direction requires augmentation.

Pilots receive two local nights off on a layover after an augmented sector. Augmented pairings require an extra day off at home after the pairing. The pilot contract also requires a longer time off at home between pairings if the next pairing is flown in the opposite direction from the previous pairing. Scheduled trip pairings are prepared twice each year, for summer season and for winter season.

Company schedulers build and assign monthly schedules. Each pilot can request one specific trip pairing and one block of days off per month. Schedules are assigned based on these requests. Schedulers normally build schedules to be fair and divide the hours equitably. They normally do not worry about landings because crews decide who lands. If a pilot has been on vacation or sick, scheduling may assign him pairings with more non-augmented sectors. By the 25<sup>th</sup> of the month, pilots know the first week of their next month's schedule. The rest of the schedule is known by the end of the month. Pilots are guaranteed, on an alternating month basis, a block of four or five days off in succession. Normally, the longest time off between pairings is four to five days. A pilot is guaranteed 12 days off per month. A normal monthly schedule is 75 hours, with a maximum of 95 hours. Annual flight time is limited to 850 hours. Simulator training is placed into a pilot's future schedule 2 months in advance. When scheduling pilots, only one crewmember may have less than four months or 200 hours experience on the aircraft. Pilots cannot trade pairings with open flying.

All pilots share standby (reserve) duty, except management and instructors, and will typically have one to two days of standby per month.

### Management of Currency / Recency Requirements

Each pilot is responsible for his currency. The JAR also requires that Air France track currency. Takeoffs and landings are tracked separately in the ACARS system to help track progress towards their requirements. However, Air France only tracks the number of takeoffs and landings in the last 180 days but not the date of these events. They print the number of First Officer takeoffs and landings on the flight papers to help manage the decision. Pilots who lose their landing currency may lose their next pairing and are not pay protected for the pairing. Approximately 10 pilots per year in the combined fleets did not get the 3 takeoffs and landings in 90 days. A Captain reported that the 340 fleet has the most problems with currency. This is because the 340 has very little tag-on flying and Captains fly one complete sector while First Officers split the remaining sector. This practice differs from other fleets where all pilots share takeoff and landings equally. Some Captains acknowledge that managing a dual-augmented crew is difficult. They would welcome some company guidelines on how to distribute landings to help with currency and fleet uniformity.

During flight preparation, the pilots decide who will accomplish the takeoff and landing. Usually the pilot with the least number of landings in the last 180 days flies the outbound sector of a pairing. It is common on a two-sector, dual-augmented pairing for the four pilots to each fly the aircraft during either a takeoff or a landing. Therefore on a four-person crew, the Captain flies either a takeoff or landing. On single-augmented, single-destination pairings (two sectors), the Captain will fly one sector while the two First Officers share the PNF duties, one for takeoff and one for landing. The First Officers will also share the PF duties on the remaining sector, one flying the takeoff and the other the landing. This helps all pilots maintain proficiency.

Landing currency can be updated in the simulator. Two pilots fly a four-hour simulator session and must accomplish three takeoff and landings, flying at least one visual pattern and one ILS approach. During this simulator session, other maneuvers including engine-out approaches are practiced as well. Following the simulator session, Air France requires the pilot to fly with a Captain instructor on his next line flight if he did not have at least one landing in the aircraft during the past 90 days. A pilot can also fly a pairing with a Captain instructor to regain landing currency instead of using the simulator.

### **Experience**

Pilots on the 744 are the most experienced for each seat position. 744 Captains have over 15 years experience at Air France and First Officers have 4 to 10 years experience. Flight operations management believes that a pilot's flying proficiency diminishes over time if he predominantly flies long-range sectors. However, since their pilots on long-range aircraft are the most experienced, they believe they can better tolerate the reduced handling opportunities. They have not experienced proficiency problems among their long-range pilots. They attribute this to a combination of factors, including very little dual-augmented flying, regular practice as both PF and PNF, and quarterly recurrent training.

## **Assigned Crew Duties**

Since there is only one Captain, there is never a change of command during the flight. Company policy requires the Captain to select a First Officer to be the acting Pilot-in-Command while he is off the flight deck. The acting PIC will occupy the right seat and is the PF during this period. The Captain must notify the purser that the pilot in the right seat is now the acting PIC of the flight. The acting PIC will make all decisions and take any necessary actions, but must notify the Captain of the situation at the earliest opportunity. During each seat change, Air France requires a briefing covering specific items.

Air France maintains a strict two-person operation for their crew. There are no assigned duties for the relief crewmembers when all four are on the flight deck, which is required for takeoffs and landings. All four pilots flight plan together.

## **Training**

### Type Qualification (Transition)

Type Qualification training follows a maneuvers oriented (Appendix E) syllabus in simulators owned by Air France. This training consists of ground school plus 12 simulator sessions. Pilots' transitioning from First Officer to Captain on the same airplane only require 3 simulator sessions and a checkride. Following successful completion of training, all pilots except those transitioning from the A320 to the A340 who have 2000 total hours and 1000 hours in the A320, fly a non-revenue aircraft flight to practice landings. This flight typically lasts one hour per pilot but is extended to 3 to 4 hours for ab initio pilots. Air France wants to eliminate this flight for pilots transitioning to the 744 from either the 767 or 777.

During training, crewmembers must demonstrate their ability to handle the emergency descent and the cruise engine failure as a solo event. This training prepares pilots for those brief periods when they may be alone on the flight deck. Training for augmented crews is also contained in their Type Qualification course.

Simulator instructors are predominately Captains with some First Officers. First Officer instructors conduct ground school and some simulator training. Captain instructors must administer the final two simulator sessions as well as all checks. Ground school instructors are pilots with at least 1500 hours experience but may not have a current license.

### Line Training

Line training consists of eight sectors and a line check. Line training is flown to different parts of the world. Air France requires a special qualification for pilots flying to the United States for the first time as a First Officer and again as a Captain. This United States qualification is accomplished during line training the first time a pilot flies an aircraft whose route structure includes the United States.

### Recurrent Training

Annual recurrent training consists of six days per year including two days of ground training, three simulator sessions (one for training and two for checks), and a two-sector line check. The two simulator checks are at six-month intervals. The first check is preceded by a training simulator session for practicing maneuvers and procedures and one day of ground school. Ground training is seven hours long and is designed to review all major aircraft systems over a three-year period. Following training, pilots are tested using a 12-question exam to satisfy JAR requirements. The second simulator check consists of a two-hour LOFT and a two-hour check. CRM is emphasized during this session. It is preceded by one day of ground school consisting of

four hours of ground training on safety and security topics and a one-hour flight simulation with the cabin crew. No systems oral is required during their annual simulator checks. First Officers in their first year on an aircraft get an additional simulator session. All ground training is accomplished with a classroom instructor using PowerPoint presentations. One pilot reported that recurrent training does not allow time to practice hand-flying skills because requirements take all the available time.

### FOQA Data

Air France uses FOQA (DAR/QAR) exceedance data information for designing simulator training. All of their airplanes are FOQA equipped. They collect and process every flight, up to 500 tapes per week. Air France uses this data for risk exposure assessment and safety analysis. They also use the information in their CRM course.

## **Practice**

### Pilot Flying / Pilot Not Flying

Normally, each First Officer will be in the control seat either as PF or PNF at least as often as every other sector. Since Air France splits the takeoff and landing for a segment, two First Officers will be in the control seat as either PF or PNF on every segment. Captains and First Officers average 3 landings per month on the 744. Captains on the 777 average three landings per month and First Officers on the 777 average two landings per month. Pilots can request additional simulator time for practice.

### Autoflight Philosophy

Hand flying the aircraft up to 10,000' and during the approach sector is typical but they do not hesitate to use the autopilot when conditions warrant. It was reported that Captains use the autopilot more than First Officers since First Officers' hand-fly more to and from cruise. Company policy now allows hand-flying with the flight director off. Captains can count an autoland for updating landing currency.

## **Physiological**

### Crew Rest Facilities

The 744, A340, and 777 all have a business comfort seat and bunk beds for use by the augmented crews.

### Rest Breaks

While no specific guidelines exist, the rest needs of the pilot that is to be the PF for the landing generally determines the rest schedule. The typical rest pattern on a dual-augmented flight is for the Captain and the First Officer occupying the control seat for landing to take a single long break during the middle of the flight. The other pilots will divide their break in approximately two equal parts and take one before and one after the landing crew rest break. Because the flying assignments (when a pilot is in the control seat as PF or PNF) are determined based on the needs of the specific crewmembers, First Officers generally do not know when they show up for a flight when they will be in the control seat. Therefore, they do not know in advance which rest break they will have. Some pilots prefer to know prior to showing up for a flight when their rest break would be. Because determining rest break schedules is not uniform among all their fleets, pilots interviewed stated they would like some company guidelines.

### Cockpit Napping

Air France has a published cockpit napping policy. It can be used on any crew complement, however it was originally designed for a basic crew. They prefer a 20 to 30 minute nap so they can actually sleep for 15 minutes. Flight attendants are required to visit the cockpit every 15 minutes when duties permit to check on the flight crew. Cockpit napping is sometimes used on dual-augmented flights and rarely used on single-augmented flights.

### Fatigue Mitigation Training

Pilots receive no special training on fatigue and fatigue mitigation. Schedules are not based on any fatigue guidelines other than those specified in the contract or by regulation.

## **Motivation and Pilot Focus**

Motivation and job satisfaction of Air France pilots is high. Crewmembers have a good working relationship with each other and are cooperative in dividing the flying PF and PNF duties among one another, based on need. This cooperative culture of sharing the flying duties and allowing all pilots to fly as PF and PNF on a regular basis helps the pilots stay proficient and motivated. Air France intentionally tracks takeoffs and landings separately to allow three pilots to be able to practice flying (either a takeoff or landing) or PNF skills on every sector. They believe this increases pilot motivation because they are able to practice flying skills on almost every sector. Interviewed pilots also said they wouldn't want to be relief pilots with no chance of sitting in the right seat because their motivation would be low.

## **Performance Failure**

At Air France, a pilot can attempt and fail Captain upgrade training twice. This has not proven to be a problem.

The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## **BRITISH AIRWAYS**

British Airways uses a dual-augmented crew on the 744. They have fifty-seven 744 aircraft with one domicile located in London, utilizing both Heathrow and Gatwick International Airports. Their 744 pilot force consists of approximately 460 Captains and 580 First Officers. A First Officer is added for single-augmented flights and a Captain and First Officer are added for dual-augmented, long-range flights. The basic crew on an augmented flight is called the operating crew and the relief crew is called the heavy crew. The 777 will soon fly segments that will require a dual-augmented crew.

British Airways has an extensive worldwide route system. They fly with a dual-augmented crew on 10% of their segments, 45% are single-augmented, with the remainder flown with only a basic crew.

Operations at British Airways fall under the authority of the Joint Aviation Authority (JAA). The JARs require a Captain have three takeoffs and landings within the previous 90 days and First Officers be in their control seat for takeoff and landing within the previous 90 days. British Airways has many requirements that are more restrictive than the JARs. Company policy requires the Captain to accomplish one takeoff and landing within the previous 28 days. First Officers must be in their control seat for takeoff and landing in the previous 28 days and also accomplish three takeoffs and landings in the previous 90 days. Additionally, both Captains and First Officers must be in the cockpit for six segments over a three-month period. All company mandated 28-day requirements can be extended to 37 days by training management but is rarely extended beyond 30 days. All of these requirements may be satisfied in the simulator, if necessary. All 744 Captains and First Officers are type rated and receive the same training. Captains maintain currency in the left seat and First Officers maintain currency in the right seat.

### **Aircrew Management**

#### Staffing

British Airways hires a mix of pilots who have previous airline or military experience and also *ab initio* pilots. Newly hired Direct Entry Pilots were awarded seats as First Officers on otherwise senior aircraft due to their previous experience and British Airways' inability to get a large number of pilots quickly qualified during expansion. *Ab initio* pilots complete training at a company owned facility.

Pilots are awarded aircraft and seat assignments based on seniority. As their career progresses, First Officers are evaluated on the basis of "suitability for command". A First Officer who fails a check or other training or withdraws from a training course may be downgraded to Category C. A Cat C First Officer is unsuitable for command and cannot fly with another Cat C pilot. They are not permitted to bid for any command position, which includes Captain vacancies or First Officer positions on augmented aircraft, unless they are "suitable".

Salary is based upon aircraft seat. Pay increases as aircraft size and speed increases. Captains are paid more than First Officers are on any aircraft. Pilots are paid extra for flying over approximately eight hours per day. This extra pay rate increases significantly as the flight time increases. As a result, the more senior pilots on an aircraft typically fly the longest routes.

Pilots receive six weeks of vacation per year and bid it based on "holiday" seniority. By contract, pilots must retire at age 55.

#### Scheduling

Block time determines when it is necessary to augment the basic crew. Depending upon departure time, a basic crew can fly between 8 hours 30 minutes and 9 hours 15 minutes block

time. After that, a First Officer is added. Requirements for adding an additional relief pilot are based upon the departure time and the length of the duty period.

The pilot contract requires a layover of two local nights whenever a flight is dual-augmented. The contract also specifies three nights off at home between trips, however, reserves may have slightly less than three full days off between trips. The pairings designate which pilots will be the operating and the heavy crew. Schedules are made to provide an equitable spread of these assignments. On a two-segment trip, one crew is the operating crew on the outbound segment and the other crew is the operating crew on the return segment. On multiple segment trips with a tag-on flight, the outbound heavy crew will fly the tag-on segments as a basic crew and then return as a heavy crew. This arrangement provides a larger distribution of flying opportunities.

Pilots bid on pre-built monthly schedules that are awarded according to seniority. Rostering (scheduling) uses a computer program with inhibitors that create lines of flying to achieve their scheduling objectives. These objectives are: each line has a variety of trips, there is an equitable distribution of trip types but not necessarily an equitable spread of landings, and trips with tag-on flying are equally distributed in the lines of flying to increase landing opportunities for all pilots. These objectives help keep a pilot current and prevent the complacency associated with always flying to the same destination. Crew assignments are listed on flying schedules specifying the assigned operating and heavy crew. The operating crew will make the takeoff and landing. The heavy crew will relieve the operating crew in cruise. Blind (secondary) line construction is automated and contains one seed trip with the remainder added later. Blind lines do not attempt to equalize landing opportunities but regular lines do. Pilots can no longer trip trade but may pick-up additional trips for extra time and pay. A newly qualified pilot gets a monthly line of flying for three months even if he is junior. OEs are known in advance so a line pilot is rarely displaced from his trip for an OE.

Reserve duty is shared by all pilots and is assigned based on accumulated points. Points are accumulated primarily on the basis of time since the previous reserve assignment. Pilots are assigned a month of reserve duty once every two to three years. Reserve pilots must be available for duty within two hours of notification.

### Management of Currency / Recency Requirements

Pilots are responsible for maintaining their own currency. Loss of currency is not common; approximately six lapses per month are noted. Currency lapses are almost exclusively due to the company mandated 28-day requirement and usually involves a Captain on vacation or a pilot on medical leave. Additionally, First Officers can have currency problems during periods of heavy route training, where trainees perform all landings. Pilots primarily maintain their currency through the bidding process. They take this responsibility seriously and can suffer a pay penalty if a loss of currency is a product of their own decisions. Pairings have a mix of operating and heavy assignments and monthly schedules have a mix of pairings, allowing the pilot to satisfy their currency obligation. Since BA has a lot of tag-on flying, more opportunities are available to satisfy currency requirements. With the concurrence of the command Captain, heavy pilots can also switch duties with an operating pilot if needed to remain current. Scheduling can give a reserve pilot a specific open trip if they will lapse currency.

Landing currency lapses are usually remedied in the simulator. Class is scheduled for one hour and includes maneuvers and emergency procedures in addition to landings. A pilot who has lapsed 28-day recency may also fly two route sectors with a Base or Line Training Captain including at least one takeoff and one landing.

## **Experience**

Aircraft type and seat position is bid based on seniority. It typically requires 28 years to hold



744 Captain and 10 years for First Officer.

When British Airways acquired the 744, they did not want to augment operations with an additional First Officer as they had on the classic 747. One reason was they were not satisfied with their First Officer level of experience. British Airways training management and the British Airline Pilots Association (BALPA) also believe that long-range international flying is more technically challenging than shorter-range operations. As a result, BALPA wanted a two-Captain, two-First Officer crew for two reasons. First, a Captain is in the cockpit during all phases of flight and second, there are no long periods of flight without a Captain on the flight deck. This arrangement also provides a level of protection when First Officer experience decreases during periods of rapid expansion. With two Captains, a highly experienced pilot is always on the flight deck.

### **Assigned Crew Duties**

British Airways operates the airplane as a two-person crew, however all four pilots participate in the flight planing. Many Captains consider it distracting to have two additional crewmembers in the cockpit and therefore prefer to have only one on the flight deck for takeoff and landing. The heavy Captain is usually out of the cockpit until needed for relief duty. The heavy First Officer usually assists the flying crew on the ground and in flight for approximately twenty minutes. The observing relief crewmember may not make any safety callouts, such as “abort” or “go around”, but should bring all observed issues to the attention of the flying crew. The heavy crew will fly the airplane during the second half of the cruise flight up to about one and one-half hours prior to landing.

The operating Captain is the Pilot-In-Command for that segment and retains responsibility and authority throughout the flight. There is no change of command during a flight. The heavy Captain has the authority to take any immediate action that is necessary while he is at the controls, but is obligated to advise the pilot-in-command. Management stated there were no reported command associated problems involving two Captains on the same crew. Captains have the same relationship with each other as they would with an experienced First Officer.

When single augmenting, at least one of the First Officers on the crew must be designated an Acting Pilot-In-Command (APIC). The APIC is an experienced and rated First Officer who is not Category C, and has been screened. The APIC is authorized to exercise command in flight above FL200.

British Airways has two operations that differ from the way most other carriers fly the aircraft. One is the use of a “controlling” pilot, the pilot who will be the PF on the segment. The controlling pilot will perform all of the functions on the ground that most airlines typically consider the Captain’s duties. These include performing the final before start cockpit preparations, performing the pushback, taxiing the aircraft (if possible), and the post-shutdown switch positioning. They feel this allows the First Officer to practice the Captains duties. The second is the use of a “handling” pilot, who is the PNF for the segment but flies the descent and arrival as the PF. The handling pilot flies until the aircraft is established on final approach. When visual contact with the runway is made, the “non-handling” pilot takes control and completes the landing. These operations were retained from one of the two predecessor carriers that were merged in the formation of British Airways and are used universally in their operation. As an example, if the First Officer will be the PF for the segment, he will perform the final before start cockpit preparations, pushback, taxi-out, and then fly the aircraft until the heavy crew relieves him. Upon returning to the cockpit after his rest break, the First Officer will fly until the top of descent. At that point, the Captain, as the PNF, will fly the descent and approach until the First Officer takes over once established on the approach and in visual contact with the runway. The First Officer will

land, taxi-in, and perform all post-shutdown switch positioning. These procedures are reversed when the Captain is the PF.

## **Training**

### Transition

Transition training follows a maneuver oriented (Appendix H) type syllabus in simulators owned by British Airways. The basic training course consists of ground school plus 10 simulator sessions. One simulator session is added for direct-entry pilots without similar aircraft type or former turboprop pilots. The basic course changes depending upon the aircraft the pilots are transitioning from or the composition of the crew. According to their syllabus, a two First Officer crew will get an additional simulator in the middle of the course to allow for any “catching up” that may be required as a result of the inevitable seat swapping necessary to complete the more important syllabus items from the correct seat. Thus the course can vary between 6 and 16 simulator sessions. Currently, maneuvers are signed-off when they meet standards but the JARs will require a change to a final check of the maneuvers.

Simulator training is accomplished by both training Captains and training First Officers. There are different qualifications for training Captains with some able to train and check in both the simulator and on the line. Other training Captains only accomplish route qualifications.

### Route

Route training (OE) consists of eight to twelve segments plus a two-segment route check. A safety pilot is required for a basic or three-person crew, normally for the first two segments.

### Recurrent

Recurrent training lasts for two days, twice a year. It consists of two simulator checks at approximately 6-month intervals. The first check is maneuver oriented and called an Operator Proficiency Check. Prior to this check the crews fly a LOFT/warm-up simulator. The second check is the License Proficiency Check (LPC), which is a comprehensive maneuver evaluation and includes the renewal of the instrument rating. Based upon FOQA (SESMA) exceedance data, an additional temporary simulator session has been added prior to the LPC. This session is on a six-month trial and will emphasize hand-flying skills of visual approaches and other selected maneuvers. This practice session will include a discussion and demonstration of recent FOQA (SESMA) incidents. A Technical Questionnaire (exam) is also required annually. Aircraft systems are reviewed during training so that all systems are covered over a three-year cycle. No systems oral evaluation is required.

## **Practice**

### Pilot Flying / Pilot Not Flying

The Captain and First Officer practice PF and PNF duties at least every other leg. They will be in the control seat for both takeoff and landing during a segment. Because of their “handling” and “non-handling” pilot concept, the pilot who is acting as PNF for the segment gets to also practice his PF skills during descent. Captains average four landings per month and First Officers average 1.6 landings per month. Pilots may request additional simulator practice during their own time. Volunteer simulator instructors who are regular line pilots conduct this practice and use time when the simulator is not being used otherwise. Scheduling tries to accommodate all requests for volunteer practice.

### Autoflight philosophy

British Airways philosophy is to hand-fly the airplane during departure and arrival as much as possible, weather conditions permitting. It was reported that more than half of their pilots hand fly on departure until above 10,000 feet MSL. Most pilots use the autopilot for descent and the first part of the arrival, and start hand-flying around 10,000 feet MSL in VMC. All approaches must be flown on the autopilot if the weather is less than 5000 feet visibility. During the arrival and approach phase, BA uses the non-landing pilot as a human autopilot, so both operating pilots fly part of the approach and proficiency can be enhanced. 98% of all landings are flown manually. Autolands may count toward the Captains landings in satisfying both JAA and BA requirements although this is not the expected norm.

## **Physiology**

### Crew Rest Facilities

The 744 has a bunk facility located in the cockpit with two horizontal beds and separated from the cockpit by a curtain style door. British Airways industrial rules (negotiated labor contract) requires a seat in the cabin to allow for non-sleeping rest on some augmented sectors. Interviewed pilots stated they rest much better in a cabin seat rather than a cockpit seat since they can “really get away from” the cockpit environment. Their aircraft configuration does not include a passenger-type seat in the cockpit. They also have a dedicated crew lavatory located in the cockpit.

### Rest Breaks

On dual-augmented flights, British Airways divides the available rest into equal halves. The heavy crew will usually start their break 20 to 30 minutes after takeoff. Since the operating crew is required to be in their seats no later than one hour prior to landing, they are usually awakened 30 minutes prior to the seat change. Crewmembers know their anticipated rest break in advance since they are assigned as either the operating or heavy crew on the schedule. Testimony from both flight management and line pilots indicate that Captains can rest better knowing another Captain is in the seat while they are in the bunk.

### Cockpit Napping

Cockpit napping is authorized for two person crews by the JAA. The company permits napping with specified guidelines. It must be done during periods of low workload and can be for a maximum of 45 minutes. British Airways flight attendants have a requirement to visit the cockpit regularly throughout the flight, whenever their duties permit, thus no special notification is required.

### Fatigue Mitigation Training

British Airways has no fatigue or circadian rhythm training or materials.

## **Motivation and Pilot Focus**

Based on their scheduling technique, pilots can expect to sit in a control seat for takeoff and landing at least once during a trip pairing. This helps keep the pilots ready to do their required duties. Motivation may be higher because pilots know they will fly the aircraft on every pairing.



The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## **KLM ROYAL DUTCH AIRLINES**

KLM dual-augments only on the 744. Their 744 fleet consists of 20 aircraft and they have one pilot domicile located in Amsterdam, The Netherlands. They have about 550 pilots flying the 744, which includes approximately 200 Captains, 220 First Officers, and 130 Cruise Relief Pilots (CRP). For single-augmented flights, a CRP augments the basic crew. The exception is the 767, which single-augments with a First Officer. KLM dual-augments on the 744 with a First Officer and a CRP. On an augmented flight, the First Officer relieving the Captain during his rest break must have an ATPL.

KLM dual-augments on five daily routes to and from Amsterdam. Destinations include Buenos Aires, Singapore, Kuala Lumpur, Narita, and Bangkok. KLM frequently uses their long-range aircraft to do tag-on flying. Approximately 40% of their segments are dual-augmented, 50% single-augmented, with the remainder flown with only a basic crew.

Operations are conducted under the regulations of the European Joint Aviation Authority (JAA). The regulator requires three takeoffs and landings in a 90-day period for both pilots. The JARs require the CRP to have simulator training every 90 days.

Captains are rated on the aircraft and maintain landing currency in the left seat. 744 First Officers maintain landing currency in the right seat. Those First Officers with more than 1500 hours total flying time receive an ATPL and type rating. Cruise Relief Pilots are qualified to operate the aircraft above 20,000 feet and do not maintain landing currency. CRPs receive the same training as the other pilots and have a Commercial Pilot License (CPL) and Instrument License (IF).

### **Aircrew Management**

#### **Staffing**

Most newly hired pilots are from the KLM training school, which takes about two years to complete. These *ab initio* pilots have about 100 hours of flight time with both single and multi-engine experience with possibly some jet experience. Few new-hires are ex-military.

KLM pilots are salaried and pay is not based on number of hours flown. Captains' salary is somewhat based on the aircraft type flown as all widebody Captains receive the same pay. First Officer and CRP salary is based on seniority (longevity). All Captains are paid more than any First Officer. There is no difference between First Officer and CRP pay for the bottom 1000 pilots on the seniority list. Pilots are allowed to reduce the amount of time they fly in exchange for a reduced salary. The company allows up to a 50% reduction for narrow body pilots, but insists on no less than 67% time for pilots in long-range operations. Retirement age is 56, but can be extended to 58 years old if a pilot elects to fly an 80% schedule starting at age 48. Pilots receive 30-40 days of vacation a year.

The company assigns the pilot's first aircraft and position, assigning them either as a CRP or narrow body First Officer. They tend to give the First Officer assignments to the least experienced pilots. This helps build their experience and flying skills. Approximately the bottom 800 (out of 2000) pilots on the seniority list are managed by the company based on the company's needs. They can be moved from position to position to share experience. Pilots not in this group of 800 are awarded new seat and airplane assignments based on seniority. Some First Officer vacancies on augmented aircraft require an ATPL. From the CRP position, a pilot must upgrade to a 737 First Officer. Pilots have a mandatory freeze of two years after equipment training. Pilots normally do not bid back to First Officer after bidding Captain, however this is allowed by the contract one time during a career.

The Cruise Relief Pilot position is an entry-level position with a planned time limit of two years during normal expansion. However, since there is currently little hiring at KLM, Cruise Relief Pilots have been in their position for about 3 \_ years. CRPs do not know when they will be able to move to the right seat of a narrow body aircraft. There is a provision in their contract that allows a CRP that has been in that position for 6 \_ years (4 \_ years after their initial two year commitment) to bump a junior pilot out of the right seat of a narrow body aircraft. However, in the current situation if there is no more hiring, there are a lot of CRPs who will be eligible to bump, but only be a few pilots to bump.

### Scheduling Rules

Flight block time is used to determine when to augment a flight. KLM single-augments when the flight time exceeds nine hours block time and double augments when the flight time exceeds 12 hours 30 minutes block time.

The collective labor agreement (CLA) specifies two local nights of rest after a duty period greater than 14 hours 30 minutes to recover from fatigue. There are occasional exceptions to this provision by mutual agreement. Days off after a trip are considered part of the pairing. For example, a seven-day trip would require five days off after the trip, resulting in a 12-day pairing. If an extra pilot is required for augmentation in one direction of a pairing, they will also use the pilot to augment on the return segment, even if not required.

Pilot schedules are built on a five-week moving time period for planning purposes and are not firm. Final pilot schedules are only released for two weeks at a time. Schedulers can inform pilots of their planned schedule three to five weeks out, but changes can still be made to this schedule. The company assigns pilot schedules. Pilots can make ten requests per year for a certain trip pairing up to three months in advance. They are notified two months in advance if they are awarded their request. After this time, pilots can call schedulers to request certain routes on a first-come first-served basis. All normal training is known well in advance, including recurrent simulator training and line checks, and built into the pilots planned schedule. Schedulers do not normally take landing currency into account when building the pilot's schedules, however schedulers will change schedules of pilots who need landings. There is no provision for trip trading among pilots or with open flying.

There are several scheduling restrictions for pilots recently trained on new aircraft. When line training is given on the 744 and augmentation is required, they schedule a First Officer instead of a CRP. KLM does not allow two newly trained pilots to fly together in their first six months after training. A Captain cannot fly to Mexico during his first year on the aircraft.

Most pilots have some reserve duty as part of their five-week schedule. Since schedules are assigned and there are no monthly minimum days off, any open days left in a pilots schedule are filled in with reserve days. Pilots normally get five days per month or less of reserve duty.

### Management of Currency / Recency Requirements

The individual pilot is responsible for maintaining his landing currency. Maintaining landing currency is not a problem because of the small number of dual-augmented flying segments, the method used to assign schedules, because pilots share landings, and because they do not have permanent reserve pilots on duty. Moreover, four yearly simulator visits are evenly scheduled during the year. Additionally, there are more landings available for the Captains and First Officers because the CRP does not maintain landing currency. Except for medical reasons, pilots do not lapse currency.

There are unwritten guidelines taught and followed on augmented flights, which allow all flying pilots to share flying opportunities and accomplish their landings. Normally the pilots discuss who needs the takeoff and landing for currency and that pilot flies the segment. It is an established company practice, on dual-augmented flights where tag-on flying is part of the pattern, to have the relief First Officer fly the initial outbound segment. The Captain and paired First Officer will then share landings on the tag-on segments. The final return segment, which now involves a new crew mix, is flown by the pilot crewmember with the greatest currency need or as specified by the Captain. An autoland is used to satisfy both pilots currency requirements.

### **Experience**

Most 744 Captains are senior, since they receive the highest salary and fly the best route structure. Pilots with approximately 20 years seniority can hold 744 Captain. The First Officers may be senior, but since all First Officers are paid the same, their seniority varies. Pilots interviewed felt that generally speaking, since most of the pilots flying the 744 have more experience, they can go longer without practicing their handling skills or accomplishing a takeoff or landing than less experienced pilots. However, KLM training management has determined that 744 pilot's hand-flying skills have suffered because of the reduced number of segments. Therefore, 744 pilots spend more time working on hand-flying skills in the simulator than narrow body pilots.

### **Assigned Crew Duties**

There is never a change of command during an augmented flight. When the Captain is off the flight deck, an ATPL rated First Officer is the acting pilot-in-command. If there are two ATPL rated First Officers in the control seats during cruise, the Captain designates the most senior First Officer to be the acting pilot-in-command. Some Captains desire "six stripes" on the flight deck, which means the CRP (two uniform stripes) will be on duty with the Captain.

KLM operates the 744 cockpit as a two-person crew at all times. All four pilots are in the cockpit for takeoff and landing. When all four pilots are in the cockpit, their operating manual specifies that the relief pilots have "no assigned duties. Common practice is to use relief crewmembers for routine tasks, such as obtaining ATIS information, and to use them as a resource during high workloads. Augmenting pilots are not allowed to call "abort" during the takeoff roll. On augmented flights, it is a company practice to have the CRP perform the cockpit preparation and set-up for the Captain. This is normally done under the Captain's supervision, through the completion of the preparatory checklist. This frees the Captain to manage all non-cockpit issues that must be handled before departure, which often interrupt and distract the cockpit crew. Like other crewmembers, the CRP may function as either PF or PNF during duty periods while in a control seat during cruise.

Typically, all four pilots participate in the flight planning process. KLM routinely faxes the anticipated flight plan to the flight crew at the layover hotel. This allows the crew additional time to study and discuss the upcoming flight.

## **Training**

### Type Qualification

Type qualification training follows a maneuver-oriented (appendix H) type syllabus in simulators owned by KLM. Simulator sessions are scheduled in four-hour blocks. Pilots are assigned a specific training syllabus based upon their previous aircraft. Total sessions per crew vary from four, in the case of a 744 First Officer upgrading to 744 Captain, to 15 sessions for an F-50 First Officer upgrading to 744 Captain. All pilots receive similar training. All Cruise Relief Pilots get extra simulator and aircraft training when upgrading from CRP to First Officer. CRPs do not keep their instrument rating current. When a CRP upgrades to First Officer, they renew their instrument rating before attending transition training. Following transition training, KLM requires pilots with less than 1000 hours of KLM flight experience to also fly an aircraft trainer where they accomplish eight takeoffs and landings.

The instructor group consists of both First Officers and Captains. The Captain instructors accomplish the final phases of training as well as the operational experience (OE) training. All instructors conduct training for half of their time and fly the other half. Management pilots conduct all aircraft checks.

### Line Training

The line training is flown with a Captain instructor for a minimum of four segments. Line training requires a pilot to fly to certain theaters of operation. If a pilot has previously flown to a specific theater, he does not have to fly there during line training. New Captains in their first 100 hours must fly with a First Officer who has previously flown to the destination.

### Recurrent Training

Recurrent training consists of four, one-day simulator sessions per year. Each simulator session is four hours long. The second and fourth simulator sessions are checks and are scheduled six months apart. The first check, the Operator Proficiency Check, emphasizes operational items while the second check, the License Proficiency Check, updates licensing requirements. The checkride is always accomplished with a Captain and First Officer crew. This requires the use of reserve pilots as fill-in crewmembers. Two CRPs are scheduled together for annual simulator training, so they get extra flying practice (not graded) while the other CRP is being evaluated on PNF duties during cruise and approach. Cruise Relief Pilots are only checked on their performance of PNF duties but must also accomplish an emergency descent from cruise and the initial steps of the cruise engine failure and shutdown procedure by themselves.

The other two simulator sessions are refresher training and are scheduled approximately three months after each check. The scheduling of these refresher training simulators is somewhat flexible, however CRPs must be in the simulator at least every 90 days. The refreshers emphasize systems review and hand-flying skills including crosswind landings. The refresher simulators cover all aircraft systems over a three-year period. All pilots also receive an additional practice simulator session that can be waived by the company. Currently only CRPs or pilots performing below average on their check get this additional PT every year. CRPs must accomplish a minimum of five takeoffs and landings and fly instrument approaches during every simulator. In addition to the scheduled quarterly simulators, all crewmembers receive a line check once a year. KLM uses FOQA data for prompt feedback for individual/group learning and training.



## **Practice**

### Pilot Flying / Pilot Not Flying

Normally every First Officer is in the control seat as either PF or PNF at least every second or third segment. Those 744 pilots interviewed considered themselves to be proficient. Interviewed First Officers said they average three takeoffs and landings a month in the aircraft, which they feel is the minimum acceptable. They believe the cooperative atmosphere of the pilots in maintaining currency, along with how schedules are assigned, help spread out the pilot handling opportunities. Captains also take less than half the landings, which provides more landing practice for the First Officers.

To practice flying skills, CRP's are allowed to request a fifth floating simulator period. This four-hour simulator period has no syllabus and allows pilots to practice whatever they desire. They usually do not use the flight director during this session.

### Autoflight Philosophy

Standard operating procedure is to engage the autopilot on takeoff at 250' AGL, and if landing manually, turning the autopilot off at approximately 2000' AGL on final approach. Since hand-flying is not emphasized in the airplane, they practice these skills during their PT in the simulator. Additionally, pilots can schedule practice simulator sessions on their own if they feel their proficiency is waning. These additional simulator sessions are seldom requested, however, because the 744 pilots interviewed felt maintaining their proficiency was not a problem.

## **Physiology**

### Crew Rest Facilities

Crew rest facilities consist of two horizontal bunks in the cockpit. The flight crew also has a lavatory in the cockpit.

### Rest Break

Pilot's rest break schedule is based on a sleep study conducted by Dutch academicians with the cooperation of KLM pilots. The rest break schedule is constructed to provide what is viewed as optimal rest, with a focus on good rest for the pilot who will perform the landing. They do not simply divide the available rest time in two equal parts for the crew to split. Rest schedules vary with the length of the flight and the time of day, but are typically a pattern of multiple breaks with at least one rest break per crewmember of 3-3\_ hours, which is considered optimal. It is also considered the maximum that permits good rest while not inducing a condition of torpor. In addition, there is a general acceptance that the pilot who will perform the landing normally gets first choice of breaks and should be in their flying seat at least 1\_ hours before landing.

### Cockpit Napping

Cockpit napping is authorized by both civil regulations and the company. It is used almost exclusively on non-augmented flights. They refer to this as the "NASA nap" after the study by that agency and use a kitchen-style egg timer on the overhead panel to provide a wake-up alarm after a maximum 15-minute nap. Their system of multiple rest breaks makes cockpit napping unnecessary on augmented flights. To help ensure pilot alertness, it is a company practice for a flight attendant to visit the cockpit at least every 30 minutes.

## **Motivation and Pilot Focus**

Overall, job satisfaction of KLM pilots is high. The crews have a good cooperative atmosphere and working relationship. Especially notable is that the Captain and First Officers treat the CRP as an equal member of their crew and involve them in as many crew functions as possible. They allow the CRP to do as many PF and PNF duties as possible, including doing the Captain's setup and engine start. This allows the CRP to learn and feel like an integral part of the crew, and to maintain proficiency (practice) in many pilot functions until they are able to move to the right seat. Interviewed CRPs liked this practice and felt it helped them maintain proficiency in aircraft systems and operations, and enhanced their motivation and job satisfaction. The ability to get extra simulator time also helps them stay motivated.

A challenge is maintaining the motivation of the CRPs over an extended period of time. Since the CRP is a new-hire position for pilots with low time, most feel that initially everyone is basically motivated, because they are glad to have a job, enjoy the routes, and gain situational experience. Everyone interviewed at KLM felt the Cruise Relief Pilot was a good new-hire program because it was designed to be limited to two years. As a result, they could learn all of the company's operations while not losing their piloting skills. When hiring stagnates, however, the CRP's remain in the job for longer than two years. Now job motivation and pilot skills start declining. Those CRPs interviewed said their motivation and focus started declining after approximately one year. Interviewees said that two to three years is the maximum time that should be spent as a CRP to stay motivated and minimize pilot skill loss.

### **Performance Failure**

A pilot who falls below standards meets with a judgment committee. This committee is comprised of management pilots who hear the pilot's case and recommend further action. Actions that can be recommended include bid restrictions, a personalized training program, or termination. A union representative watches the proceedings as an observer to ensure the proceedings are fair. At the end of the proceedings, the union representative says whether he agrees with the process or not.

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## LUFTHANSA

Lufthansa dual-augments on both the 744 and the A340. They have one 744 domicile located in Frankfurt and two A340 domiciles located in Frankfurt and Munich. The 744 fleet has 26 aircraft flown by approximately 230 Captains, 210 Senior First Officers (SFO), 130 First Officers, and 25 Cruise Relief Copilots (CRC). The A340 fleet has 25 aircraft and approximately 210 Captains, 120 Senior First Officers, 140 First Officers, and 7 CRCs. Lufthansa dual-augments with two additional First Officers and single augments with one additional First Officer. The First Officer relieving the Captain must be a Senior First Officer (SFO), meeting certain experience requirements and trained in command responsibilities. Lufthansa also has 32 Cruise Relief Copilots who are former flight engineers trained for duty as a non-landing qualified relief pilot. This position will be eliminated when these individuals retire. Lufthansa can use one CRC in place of one First Officer on a single or dual-augmented flight.

Lufthansa flies approximately 10 to 20% tag-on flying. They fly 65 % of their segments single-augmented and 35 % of their segments with a basic crew. Although they dual-augmented on the Frankfurt-Manila route in March when we visited them, they have recently stopped flying all dual-augmented segments. Improved approach equipment at one airport had reduced their dual augmentation flying from two destinations to just one. Access to airspace permitting more direct routing eliminated the need for dual-augmentation on the last segment. Lufthansa will no longer dual-augment any flight segments and expects that to be permanent.

Operations are conducted under the regulations of the European Joint Aviation Authority (JAA). Pilot licensing remains under the authority of the German Civil Aviation Authority (CAA) but will come under the JAA later this year. The regulator requires three takeoffs and landings in a 90-day period. Joint Aviation Regulations (JARs) will soon require First Officers to make only one takeoff and landing every 90 days. However, Lufthansa will require First Officers to accomplish three takeoffs and landings every 90 days either in the airplane or simulator. Captains are rated on the aircraft and maintain landing currency in the left seat. Senior First Officers and First Officers maintain currency in the right seat. Senior First Officers are rated (ATPL and type rating) on the aircraft with a limited cruise command authority rider on their license. They can exercise command above 20,000 feet. Cruise Relief Copilots are qualified to operate the aircraft as PF or PNF above 20,000 feet and do not maintain landing currency. They must be with the Captain to act as the flying pilot. CRCs receive the same training as the other pilots and hold a Commercial Pilot License (CPL) and Instrument License (IF).

### Aircrew Management

#### Staffing

Most new hired pilots are *ab initio* cadets. They also hire pilots that are more experienced, including military pilots, but have an entry age limit of 32 years old. Initial training for an *ab initio* pilot candidate includes initial flight certification at the Lufthansa Pilot school or the KLM training school. The Lufthansa Pilot school holds ground and simulator training at Bremen and flight training in Phoenix. It takes two years to complete.

Aircraft seat and type are bid on seniority. A narrow body pilot, both Captain and First Officer, must decide to bid for either the 744 or A340 wide body position. They cannot fly both. Once you are a wide body Senior First Officer, you must bid narrow body Captain next. A wide body SFO can never upgrade to their respective aircraft Captain position.

Lufthansa has a pilot exchange program with two other subsidiaries under the same holding company, a supplemental or charter carrier and an air cargo carrier. On an “as needed” basis,

pilots of Lufthansa may bid to fly for the charter or cargo carrier. One of the motivations for a Lufthansa pilot to choose to fly for the charter or cargo carrier is the bid-limiting feature of the Lufthansa pilot contract. This is the only way Lufthansa pilots can fly a second wide body aircraft.

Lufthansa pilots are salaried based on their seat position and is the same for all aircraft types. SFOs receive additional monthly pay over a regular First Officer. Sixty percent of the widebody copilots are SFOs. This percentage of SFOs allows scheduling flexibility since a SFO can also fly a First Officer pairing. Narrow body Captain also pays more than wide body First Officer. Pilots receive six weeks of vacation per year. They can take it all at once or divide it up into as many as five periods. Pilots can also fly part time schedules.

Pilots retire at 55 years old. They can prolong retirement for one or two years and make 10% more than their retirement pay with some loss of pension.

Lufthansa initially dual-augmented with two complete crews: two Captains and two First Officers. They changed to a single Captain system around 1992 for several reasons. The financial situation of Lufthansa in 1992 was extremely negative. This allowed them to optimize costs as well as the amount of personnel needed to operate the aircraft. Senior First Officers earned much less than a 747 Captain. Government rules were unclear as to who was in command with two Captains. They experienced some command conflicts during flights because they did not have clearly delineated roles for each Captain. Thus, with the concurrence of the pilot union, a single Captain system was instituted.

### Scheduling

Flight time is not used to determine when to augment a flight. Instead, a flight requires single augmentation when the distance exceeds 4200 great circle nautical miles in length if flown at M.85 on the 744 and M.83 on the A340. Duty time regulations under the JAA are under discussion and are yet to be resolved, but both current German CAA regulations and the prospective JAA regulations have no provision under which dual-augmentation is mandated. Similarly, the pilot contract permits, but does not require, dual-augmentation under any specific circumstances.

Currently a non-augmented flight may be scheduled for a duty period of up to 14 hours, with maximum actual duty time limited to 16 hours. Augmented flights may be scheduled with a duty period of up to 16 hours and 30 minutes (with a maximum actual duty period of 20 hours). If not at the home base and the duty period is anticipated to exceed 16 hours and 30 minutes, company policy requires the Captain to survey the flight and cabin crew. The Captain then decides whether to extend the duty day up to 20 hours. These are the same limits and guidelines that would apply to any dual-augmented flights. Contractual provisions require a layover of two local nights after extended range flights. Pilots are scheduled for a minimum of one day off after a pairing that traverses seven time zones or less. If a pairing traverses more than seven time zones and the subsequent trip is flown in the opposite direction, then a pilot receives five days off between trips.

Company schedulers build and assign monthly schedules. Pilots receive their schedules on the 27<sup>th</sup> of the preceding month. Pilots can make a request each month for a specific pairing and a specific block of four days off in a row. Pilots are awarded these based on previous awarded requests, seniority, and availability. They rarely have more than four days off in a row, unless on vacation. Regular lines have a minimum of 10 days off per month with a minimum of 35 days off per quarter. Line training, line checks, recurrent training, and simulator training is planned for well in advance and built into the schedule (e.g. not done on days off nor any trips dropped). Scheduling goals are to give all the pilots approximately equal flight time and equal days off. Schedulers do not consider landing currency when building the pilot's monthly schedules nor do they try to equally distribute landings. They usually schedule the SFOs the out-and-back pairings and schedule First Officers to fly the tag-on flying with the Captain. On a pairing containing four segments, an unwritten but commonly accepted procedure by Captains allows the SFO to

normally fly a takeoff and landing on the outbound and/or return portion only, while the Captain and the First Officer fly the additional tag segments. Schedulers will place some pairings which contain non-augmented segments into a SFO monthly schedule to provide them some landing opportunities. Pilots are paid a minimum of 75 hours block time then get increased overtime pay up to 88 hours maximum per month. They can exceed 88 hours once per quarter, but not more than 95 hours. There is no open flying trip list, but pilots may trade trips through the scheduling staff. Company policy requires that schedules be built to preclude two pilots flying together who have less than six months experience on the aircraft.

Reserve duty is shared equally among all pilots. A pilot receives approximately five to seven days of reserve duty twice a year. They must be within one hour of the airport while on reserve. Schedulers fill a trip with a pilot on reserve as soon as it becomes available.

### Management of Currency / Recency Requirements

Pilots (except CRCs) are responsible for their currency, but do not lose pay if they lose currency. The company does not track or verify pilot currency before a flight. There are a number of reasons pilots seldom lapse currency, including quarterly simulator sessions, very few double augmented segments, additional tag-on flying, no permanent reserve lines, and a shared landing culture. Approximately five First Officers needed landing currency training last year. An autoland also counts towards a Captain's currency requirements.

All pilots share the landings on a cooperative basis. Fleet management requests that Captains give equal practice to SFOs and First Officers. Some Captains give both landings to the SFO and First Officer on a pairing containing two segments. Captains typically fly less than 50% of the landings. However, training center management encourages Captains to take more landings or pilot flying segments if they feel they need more practice. Pilots can fly their next pairing if they will lose their currency during the later portion of that trip. They, of course, must make a takeoff and landing during the early portion of the trip.

A pilot's recurrent simulator session may be moved up in his schedule slightly to update currency. Since pilots very seldom lapse currency, they do not have a formal landing class syllabus. For the occasional pilot who needs landings, they can move up their recurrent training or provide a modified refresher session.

## **Experience**

Because of the career progression allowed by their contract, the Captains and First Officers flying the 744 are normally the most senior in their respective groups. It typically takes ten years to become a Captain and an additional six years to wide-body Captain. Senior First Officers on the 744 have approximately eight to 12 years with the company and First Officers have four to eight years. The SFO position at Lufthansa utilizes the most senior and experienced First Officers as second in command on augmented segments.

## **Assigned Crew Duties**

Lufthansa operates the aircraft strictly as a two-person operation. Thus, they do not have specific duties to be performed by the relief pilots when they are on the flight deck. Common sense guides the use of these pilots when necessary. There is no change of command during a flight. When the SFO relieves the Captain, he sits in the left seat. The SFO is officially licensed to act as Pilot-in-Command during cruise flight on the 744 or A340. The SFO acquires legal responsibility for operating the flight and assumes liability for all actions taken while the Captain is off the flight deck, but is also required to inform the Captain of a situation at the earliest

opportunity. An SFO receives a rider on his license for cruise command during SFO training. There is no specific written list of items required for when to wake-up the Captain. Whenever it is questionable that the destination can be reached safely, the SFO must call the Captain to the flight deck for a decision.

## **Training**

### Transition Training

Training for the 744 follows a maneuvers oriented, Appendix H type format in simulators owned by the company. 744 transition training spans 26 days including 15 lessons of CBT, 11 lessons in the FBS, and 11 simulator sessions including the checkride and landing session. Training for the A340 follows a simulator-integrated transition program. It contains 21 lessons and requires both a PF check and PNF check. Training Flight Engineers conduct ground school, Training First Officers conduct FBS and procedures training, and Training and Check Captains (TC) conduct simulator sessions. Training First Officers teach about seven days a month while Training Captains fly 20% and train 80% of the month. The Training Captain administers the checkride and if successful, a simulator landing class. Each pilot receives two hours of training and at least 10 takeoffs and landings to full stops only. If the trainee is a new-hire pilot without jet aircraft experience, his first transition course will include an aircraft trainer with fourteen landings.

### Line Training

Line training is flown to achieve a minimum of eight takeoffs and landings for the trainee. This completes the rating requirements for the trainee according to zero-flight time training requirements. Fleet policy requires that it be flown to all four theaters of operation including North America, South America, Africa, and Asia. They try to schedule the first two pairings to include tag-on flights. New Captains land the aircraft on the first segment of the line training while new First Officers observe the Training Captain land the aircraft on the first segment. For the first four segments of a First Officer line training, a complete crew plus the First Officer flies the pairing. The regularly scheduled First Officer becomes a safety observer. The line training ends with a two-segment line check with the Training Captain in an observer's seat.

### Recurrent Training

Recurrent training consists of four, one-day simulator sessions per year. Two of the simulator sessions are checking events scheduled six months apart, and are called the Operator Proficiency Check (OPC) and License Proficiency Check (FCL). The OPC emphasizes operational items while the FCL updates licensing requirements. The other two simulator sessions are refresher training and are scheduled approximately three months after each check. The refreshers emphasize hand-flying skills including crosswind landings, a manual, raw data ILS approach, and GPS approaches. A Captain/First Officer, SFO/First Officer, or First Officer/First Officer combination may take simulator refresher training together. CRC recurrent training is the same in frequency and duration. They are tested on cruise and enroute procedures. Once a year they also travel to Phoenix for flying training and renewal of their CPL and IF licenses. Every pilot gets a two-segment, annual line check. Both flying and pilot not flying duties are checked. The Training Captain usually flies as a Senior First Officer and is part of the crew. Additional required training includes a JAR Ops Ground Refresher review, which can be accomplished at the training center or at home using a company supplied CD-ROM. Also required is an annual half-day emergency equipment/dangerous goods session. A two-day CRM refresher is required every three years.

Management recognizes a loss of proficiency on long-range flights and has instituted this recurrent training program of four simulator sessions a year (quarterly) to provide opportunity for

pilots to practice hand-flying. They believe every 90 days in the simulator is best, and they begin each period with each pilot manually flying several visual approaches to practice handling skills.

### SFO Training

To qualify for Senior First Officer, a pilot must have 42 months with the company, 2500 hours total, and 500 hours in type, although 250 hours can be substituted from another long-range aircraft. SFO training consists of a three-day leadership seminar followed by simulator training emphasizing cruise emergencies and decision making in a LOFT format. The final check is a three-hour aircraft check. It is accomplished in cruise flight with the SFO making all the decisions. SFO simulator training also includes left seat landing practice.

## **Practice**

### Pilot Flying / Pilot Not Flying

First Officers practice PF or PNF duties at least every third segment. A common practice is for the Captain to have one of the First Officers who will not get a takeoff and landing during the pairing to serve as PNF when the Captain is flying a segment. Pilots average approximately two landings per month. Captains and SFOs recognize that they are more experienced (total flying hours and years of service) than the First Officers. Therefore, they feel that they can get by with fewer landings to maintain proficiency than the younger, less experienced First Officers. As a result, an SFO's opportunity to practice PF or PNF duties is a little less than a First Officer. Captains typically fly less than 50% of the landings because Fleet Management requests that Captains give equal practice to SFOs and First Officers..

### Autoflight Philosophy

When traffic permits, Lufthansa emphasizes hand-flying on takeoff and landing. When crews hand fly, they usually fly the aircraft up to approximately 10,000 feet on the departure and disconnect the autopilot at approximately 4,000 feet on the arrival.

## **Physiology**

### Crew Rest Facilities

Crew rest facilities on the 744 consist of two horizontal bunks in the cockpit. The 744 flight crews also have a lavatory in the cockpit. On the A340, crew rest facilities consist of two bunks located behind the cockpit and adjacent to the first class galley. This makes sleeping difficult during cabin service. The A340 crews have to pass through the first class galley and use first class passenger lavatories.

### Rest Breaks

Crews typically divide the rest break time in half. The rest schedule is decided in a cooperative manner, so individual fatigue problems can be accommodated. When using single augmentation, the first preference for rest break is given to the pilot flying. Second preference goes to the Captain, if he is not the pilot flying. The rest break period starts at least 30 minutes after takeoff and must end at least 30 minutes before landing. Most pilots interviewed felt that 30 minutes was not adequate time to prepare for landing.

### Cockpit Napping

The company, in the operations manual, authorizes napping in the cockpit for basic crews. Crews should not come to work needing a cockpit nap. It must be taken in cruise flight and not

occur during the last one hour 30 minutes of flight. The cabin crew must be advised to make periodic cockpit visits every 10 to 15 minutes. Naps are limited to about 30 minutes. The Captain plans and monitors cockpit napping to ensure it takes place during the lowest workload portion of the flight.

#### Fatigue Mitigation Training

There is no specific training on understanding and accommodating fatigue, fatigue mitigation or circadian rhythm maintenance.

### **Motivation and Pilot Focus**

Motivation and job satisfaction of Lufthansa pilots is high. Crewmembers have a good working relationship and are cooperative in dividing up the takeoffs and landings, and PNF duties among all crewmembers based on need to ensure everyone has the opportunity to stay proficient. For example, on a two-segment pairing flown with four pilots, the First Officer who will actually fly one of the segments and get a takeoff and landing will allow one of the other First Officers to be PNF for the Captains segment. The cooperative atmosphere of the pilots in sharing the flying duties helps the pilots stay proficient and motivated because they are in the control seat as PF or PNF normally on every pairing, or at least every other pairing. Because scheduling evenly spreads the different types of pairings among all the pilots, those interviewed said this leads to a somewhat stable lifestyle and job satisfaction. The ability to request one specific trip a month and a four-day block of time off is also a motivator.

One motivational problem mentioned during interviews was with their Cruise Relief Copilots. Some CRCs lack motivation because it is a permanent position with no chance for promotion. Even though CRCs complete the same training as other pilots, they are not allowed to fly the airplane below 20,000 feet. Captains and First Officers do, however, treat the Cruise Relief Copilots as equal members of the crew and use their experience.

### **Performance Failure**

An excess of 160% transition training results in a management decision to continue training, return to previous bid, or termination. If a pilot fails the same PC twice, a decision on more training or termination is required.

### **Other Noteworthy Programs**

All required pilot publications are maintained on each aircraft. This includes one complete set of manuals, two sets of enroute charts and airport instrument plates for the area (North America, South America, etc.), and one set of emergency, diversion airport instrument plates. Pilots are issued and maintain the company and aircraft operations manuals, but not enroute charts nor airport instrument plates. They do not need to carry any personal publications on a flight except those they specifically desire. They can also obtain current charts or any airport instrument plates at flight operations for personal use.

Flyaway packets are available for study based on specific destinations.





The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## **NORTHWEST AIRLINES**

Northwest Airlines double-augments on the 744. Their 744 fleet consists of 14 aircraft with one pilot domicile located in Detroit, Michigan. They have approximately 250 Captains and 200 First Officers flying the 744. The Northwest culture requires a Captain be in command in the left seat at all times. As a result, they single-augment with an additional Captain and dual-augment with an additional Captain and First Officer crew.

Northwest Airlines predominantly uses the 744 to fly long-range routes. However, they also fly a few shorter-range flights within the Pacific region from their Narita hub. Approximately 85% of the flight segments on the 744 are dual-augmented and approximately 10% are single-augmented.

Flight operations are regulated by the U.S. Federal Aviation Authority (FAA). All Captains and First Officers must accomplish three takeoffs and landings every 90 days. This currency requirement can be satisfied in either the airplane or the simulator. All 744 Captains are type-rated and maintain landing currency in the left seat. All 744 First Officers are fully qualified, but not type-rated, and maintain landing currency in the right seat.

### **Aircrew Management**

#### Staffing

Newly hired pilots come from general aviation, the military, and other airlines. Approximately half of the newly hired pilots are from the military while the remaining half are from general aviation and other airlines. The average experience of newly hired pilots is approximately 3800 hours.

Aircraft seat and type are awarded by seniority. A pilot may bid equipment or position vacancies anytime his seniority and/or bid freeze permits or he may remain in his position as long as desired. Pilots incur a two-year bid freeze after training on new equipment. A pilot may also bid to a lesser paying seat or aircraft position.

Northwest pilots are paid to equipment type, based on gross weight and speed. They also receive longevity raises the first 12 years and special incentive pay for international flying. They are guaranteed the greater of actual or scheduled flying time for each pairing. Vacation is accrued by longevity and ranges from 16 to 44 days per year for 744 pilots. Captains on the 744 usually have 44 days per year of vacation and 744 First Officers typically have between 28 and 37 days of vacation per year. Pilots retire at age 60.

#### Scheduling

FARs require a single augmented crew when scheduled flight time exceeds eight block hours and a double-augmented crew when scheduled flight time exceeds 12 block hours. Duty time limits for a basic crew are 13 hours scheduled, 15 hours actual; for a single-augmented crew, 15 hours scheduled, 16 hours actual; and for a dual-augmented crew, 20 hours scheduled and actual. If a pattern requires an augmented crew on only one segment, the pilot contract does not require an augmented pilot on the remaining segment. As a result, scheduling will deadhead the Captain on the segment he is not required to fly. This may allow some scheduling flexibility since rest requirements for a deadheading pilot are less.

Following an augmented pattern (pairing), crews must be off for twice the flight time of the pattern. A basic crew requires 11 hours 30 minutes off at the home domicile after a pattern that contains an international segment. All trans-Pacific and trans-Atlantic segments require 12 hours off before the segment and 15 hours 45 minutes off after the segment. During a pattern, pilots must be off for 15 hours 45 minutes when switching from a basic crew to an augmented crew and

vice versa. Pilot union (ALPA) representatives are permitted to review patterns for schedule rule compliance and to identify those that may contribute to pilot fatigue. Contractual work rules specify some scheduling guidelines to account for home domicile (body) time.

Pilots use a preferential bidding system to make requests for their schedules. Any planned training or other known absence is scheduled prior to preferencing. Monthly schedules are built by computer according to a pilot's seniority. Pilot's monthly flying schedules are built such that the maximum number of hours varies between 75 and 82 hours with a minimum guarantee of 12 hours less than the maximum. This maximum for each aircraft and seat position is determined monthly by pilot scheduling. Monthly lines average 12 to 13 days off but do not have a guaranteed minimum.

Trip trading is permitted with other pilots and with open flying, but must be approved by the crew schedulers. Trip trades with open flying are awarded daily based on contract priorities and seniority. Pilots may acquire additional pay through trip trading. Trip trading may also allow them to exceed the monthly line maximum and receive overtime pay.

Vacation can be taken in groups of between 7 and 23 days. A month containing 23 vacation days is considered a full month of flying for pay purposes. Since a vacation day is worth 3 hours 30 minutes, a partial vacation month can be supplemented with trips that are bid in the normal fashion to build a monthly flying schedule with total hours between the minimum and maximum amounts.

The junior pilots on a fleet are awarded reserve lines. A pilot may avoid reserve by putting a restriction on his equipment bid specifying "blockholder" only. Reserve lines have 12 days off in a 30-day month and 13 days off in a 31-day month. Reserves receive a minimum pay guarantee of 75 hours. Reserve pilots can fly on a displacement basis if they feel their proficiency is low. Unfilled patterns are assigned to reserve pilots based on a pilot's number of reserve days available and when he returned from his previous assignment.

#### Management of Currency / Recency Requirements

The primary responsibility for maintaining takeoff and landing currency is placed on the individual pilot. The training scheduler and crew desk both track and monitor each pilot's currency. The training scheduler notifies the pilots via the e-mail system when their currency is about to lapse to remind them of their need to get a takeoff or landing. If needed, they schedule the pilot for landing currency training in the simulator. An aircraft autoland counts as a landing for both the Captain and First Officer.

If a pilot is not current for a trip, they can be placed in a landing class in lieu of flying the pattern, then be on reserve for the remainder of the days of the trip to obtain full pay protection. A pilot who will lose currency during a pattern may still fly the trip and update currency prior to the lapse date. There is some financial incentive to lapse currency since pay for a travel day and a training day are given as a remedy, however the new recency course requirements described next make this less desirable.

All pilots with lapsed currency must accomplish a four-hour simulator session that includes critical maneuvers and emergency procedures in addition to landing practice. Landing currency training was given to approximately 200 Captains and First Officers each during the nine-month period from 1/1/99 to 9/30/99.

### **Experience**

Pilots flying the 744 at Northwest Airlines are senior Captains and First Officers. A pilot is able to fly as a 744 Captain after about 16 years with the company. First Officers are also very experienced and have an average of 10 years with the company.

Those interviewed generally believe the overall proficiency of long-range pilots is highest when they complete their line training. Proficiency starts to diminish over time because of the reduced number of segments and practice opportunities. Fleet management felt that since the flying experience of their 744 pilots is high, the rate of proficiency loss is slower and they are better able to cope with the effects of the fewer practice opportunities than if they were less experienced pilots. Fleet management and line pilots interviewed stated they have not noticed a difference in the rate of proficiency loss between Captains and First Officers.

### **Assigned Crew Duties**

The Captain in the left seat is the pilot-in-command of the flight. This command changes to the new Captain whenever a change of duty takes place. The Flight Operations Manual specifies that, in the event any operational conflict should develop between the Captains on board, the judgment of the senior Captain shall prevail. This provision has not created any ambiguity for crewmembers and has rarely been used to resolve any conflict during a flight.

On dual-augmented flights, the segment is normally divided into two equal halves. One crew is in the control seats for takeoff and the first half of cruise, and the second crew is in the control seats for the second half of cruise through the landing. The Captain for the second half of the flight indicates he is pilot-in-command by signing the flight plan. All members of the flight crew participate in flight planning, at which time the order of flying and the specific pairings of crewmembers is determined on the basis of personal needs, currency needs, or personal preference. Crewmembers interviewed stated that the relationship and atmosphere established by the two Captains during the initial flight planning session sets the tone for the professional environment in the cockpit and all subsequent CRM (C/L/R).

During the mid-point crew change, the new Captain and First Officer do not simultaneously relieve the first crew. They usually wait 10 to 30 minutes between when the First Officers change and the Captains change so the new pilot has time to fully wake-up before the other pilot joins him. Typically, the First Officer changes first, followed by the Captain. Pilots are required to use a published crew change briefing guide for all seat changes. According to flight operations management, this permits a seamless transfer of command and control.

Northwest adheres closely to the two-person operation of the aircraft, whether augmented or not. There are no specific duties assigned to the relief crewmembers when all four are on the flight deck, which is required for takeoff and landing. However, the culture has evolved where specific tasks are traditionally completed by the relief crewmembers to assist the flying crew during busy phases of the flight.

### **Training**

#### Qualification (Transition Training)

Qualification training on the 744 is in accordance with the Advanced Qualification Program (AQP). Qualification training consists of 16 days for systems and procedures, three days for the FBS, and ten full-flight simulator sessions. FMS instruction is integrated into system lessons, as appropriate. A new state of the art classroom, a Flight Management Computer (FMST), a product of Aerosim, with an integrated computer based instruction method for teaching all FMS operations, has recently been employed. This program includes free-play capability and fixed base flight simulation. It also permits scripted briefings and lesson plans, contributing to standardization of instruction.

Captain and First Officer instructors must have the seniority to fly the aircraft on which they instruct and/or administer checks. Captain instructors conduct all full-flight simulator training.

First Officer instructors conduct ground training. Instructors who work in the training department normally alternate one month teaching and one or more months flying. As a goal, each instructor works in the training department a minimum of four months and a maximum of six months per year.

### Operational Experience Training

Operational Experience (OE) must consist of a minimum of 25 flight hours, to include one segment as PNF and at least three segments as PF. Pilots typically fly about 25-30 hours in the pilot seat due to the long segments and patterns commonly scheduled. This time does not include rest time while in flight. OE includes route qualification flights to both Europe and Asia for a pilot who has no previous international experience, or just to Asia for those previously international qualified.

### Continuing Qualification Training (Recurrent)

Continuing Qualification is accomplished once per year. It consists of four consecutive training days and includes aircraft systems, Special Purpose Operational Training (SPOT), a Maneuver Validation, and a Line-Oriented Evaluation (LOE). SPOT consists of training on all aircraft critical maneuvers and items of fleet emphasis including FOQA incidents or specific practice items such as unusual attitudes and windshear. SPOT training emphasizes human factors issues. To help aircrew proficiency, pilots now fly the simulator three of the four days. The second day simulator session currently emphasizes VNAV procedures both in the classroom and in the simulator. Pilots practice FMC procedures on the FMST in association with the simulator period. The LOE emphasizes decision making and CRM, and not reaching a pre-determined outcome. Captains are checked every other year during one segment of a line flight. Due to proficiency concerns on the 744, Northwest Airlines has doubled the amount of line checks they give each year.

## **Practice**

### Pilot Flying / Pilot Not Flying

Under their augmentation system, all pilots get an opportunity to practice PF or PNF skills every flight. Captains average three landings per month while First Officers average two landings per month. The pilot conducting the takeoff or landing for a particular segment is usually determined by the crew, based on the requirements needed by each individual to remain current. If requirements do not exist, they decide landing assignments based upon seniority or personal preferences. The Captains and First Officers often determine this independently. This sometimes results in the Captains flying their half of the augmented segment with the First Officer that is scheduled on the same pattern with the other Captain.

### Autoflight Philosophy

Pilots may hand-fly the aircraft if workload permits; however, they usually fly with the autopilot and autoflight system. Pilots are required to fly with autopilot and autothrottle for some departure and approach procedures to comply with local requirements, such as noise abatement procedures.

### FMS Proficiency

To help pilots maintain proficiency in FMS operations and procedures after they finish OE, computer stations with the same CBT capabilities as those at their Training Center have been installed at Detroit flight operations. Pilots can accomplish the different instructional units that

already exist or use the free-play feature to fly approaches to any airport. They hope to install these computer systems at their Narita hub so pilots can practice FMS procedures during layovers or prior to a flight. The Northwest Training Center is planning to make all aircraft Qualification and Continuing Qualification CBT lessons available on the Internet so pilots can access the system anywhere in the world via a CD-ROM interface on a personal computer. As of May 25, 2000, the FMST is available to selected line pilots and instructors via the Internet for beta-testing. Northwest anticipates that the FMST will be available to all 744 pilots by July 15, 2000.

## **Physiological**

### Crew Rest Facilities

The crew rest facility on the 744 has two horizontal bunk beds located in a room adjacent to the cockpit and separated by a door. They also have a single business class seat in the cockpit they can use during rest breaks. There is not a private lavatory in the cockpit.

### Rest Breaks

Prior to coming to work, pilots generally do not know whether they will fly the first or second half of the initial outbound segment. As a result, they do not know which rest break they will have so they cannot plan their rest condition prior to their trip. They generally are able to accommodate special individual fatigue problems because of the cooperative crew culture and the fact that either First Officer is allowed to fly with either Captain on a given segment. Crews stated that normal trip departure times occur early enough in the day that fatigue is less a factor.

The crew at the controls for landing has been continuously on duty since the mid-point of the flight. Testimony from flight crews is that this does not result in undue fatigue and allows the flying crew time to prepare for upcoming terminal area operations.

Pilots interviewed believe that always having a qualified Captain and First Officer crew on the flight deck contributes to better rest when they are off the flight deck. They also stated that splitting the flight in half allows the first crew on duty to reduce their stress and get better rest because they are relieved of any further duty except as safety observers for the arrival. The pilots stated they sleep better because they are off duty and don't have to worry about waking-up and landing the airplane.

### Fatigue Mitigation Training

Formal fatigue mitigation training is given to all newly hired pilots. This training includes a video by Mark Rosekind, formerly of NASA Ames Laboratory, who discusses fatigue issues based on his research. While this training may come at a time when it is not immediately used by the pilot, it does provide tools for handling individual fatigue when needed. Crew testimony is that it is useful information.

When a pattern requires augmentation on only one segment of a pattern, scheduling usually deadheads the augmenting pilot on the other segment. This increases schedule flexibility since the deadheading pilot has reduced rest requirements. However, this may contribute to the pilots overall or cumulative fatigue because of the reduced rest requirements between assignments. Pilots interviewed liked this practice since it reduces the number of times a commuting pilot must return to his domicile for a trip. Thus he gets more time at home.

## **Motivation and Pilot Focus**

Overall motivation and job satisfaction of the 744 pilots is high. Since pilots will occupy a control seat every segment, pilots arrive to work with a focused, positive, professional attitude and

ready to fly.

### **Performance Failure**

Training problems are handled by the 744 Fleet Training Captain with advice from the trainee's instructors. A First Officer who fails Captain upgrade training incurs a two-year freeze and returns to his previous aircraft and position. After the freeze expires, he may attempt upgrade training again.

The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## **QANTAS AIRWAYS**

Qantas double-augments the 744 and occasionally the 747-2/300 “Classic” aircraft. They have twenty-four 744 and eleven Classic aircraft with one pilot domicile located in Sydney, Australia. Qantas uses Second Officers to single or double-augment long-range flights. Their 744 pilot force consists of approximately 170 Captains, 160 First Officers, and 250 Second Officers. Their Classic fleet has 88 Captains, 78 First Officers and 65 Second Officers.

Qantas Airlines uses the 744 to fly predominantly long-range routes. However, they also fly shorter-range flights. About 15% of their sectors are flown with a single-augmented crewmember and about 85% of their 744 sectors are dual-augmented.

CASA, the Civil Aviation Safety Authority, requires all Captains and First Officers accomplish one takeoff and landing every 35 days. Captains must accomplish three night takeoffs and landings every 90 days. First Officers must accomplish one night takeoff and landing every 90 days. Second Officers must fly as a crewmember every 35 days. This can be extended to 56 days without training as long as the Captain is satisfied with their performance. Qantas requires First Officers to accomplish three night takeoffs and landings every 90 days. They also require Captains to fly an ILS approach every 45 days. All “Longhaul” (747/744/767) currency and recency requirements are tracked via ARMS (Aircrew Resource Management System). All 744 Captains and First Officers are type-rated and receive the same training. Classic crews are type-rated separately. Captains maintain landing currency in the left seat. First Officers maintain landing currency in the right seat. Second Officers are not trained in ground operations and are not evaluated nor do they maintain qualifications for takeoff and landings. The Second Officer can manipulate the controls above 5000 feet AGL.

Qantas was mostly an international airline until 1992 when they acquired a 737 domestic airline. “Short-haul” pilots from the acquired domestic 737 airline were given a 1992 date of hire for seniority if transferring to a wide body aircraft. To date only 737 First Officer to 767 First Officer transfers have occurred. The seniority to transfer from 737 First Officer to 744 First Officer will occur soon. Prior to this, all First Officers at Qantas were previously Second Officers with international experience.

### **Aircrew Management**

#### Staffing

Newly hired pilots are a mixture of 10% *ab initio* cadets, 65% general aviation and 25% military. Their experience level ranges from *ab initio* pilots with 200 hours to those hired from general aviation and military with much more flying time.

Bidding for upgrade in seat position and new aircraft type for the international operation is strictly by seniority. Pilots submit written bids and cannot change the request for the next six months. First and Second Officers that are eligible by seniority and have not applied to upgrade are sent a letter by the company recommending they upgrade, but they are not required to do so. Pilots can remain as a First or Second Officer as long as they desire. Pilots are not allowed to downbid to smaller equipment in the same seat or downbid from Captain to First Officer. The difference in pay between 744 Second Officer and 767 First Officer is, for some pilots, not enough to offset the life style afforded by the 744 flying. Pilots receive an equipment training freeze of 18 months. The only exception to the downbidding restriction is that First Officers are allowed to bid back to an aircraft that they are about to commence command training on. This allows them to spend approximately six months as First Officer prior to commencing command training: e.g. 744 First



Officer to 767 First Officer to 767 Captain. The regulator does not allow pilots to be dual-qualified on multiple equipment.

Pilots are paid based on seat position and seniority. Their pay for a pairing includes a guarantee of one hour pay per four hours away from base. They also receive a premium of one hour additional pay for every three hours of night flight, and a flight time over 12 hours is paid at 1.5 times the normal rate. Pilots receive six weeks vacation every year or four weeks every eight months and are normally required to take it all at once.

Longhaul pilots retire at age 60, shorthaul (domestic) pilots under local legislation have no upper limit and are only subject to competency and voluntary and medical retirement. Longhaul Captains can not downbid to 737 Captain to extend their retirement age.

### Scheduling

The following discussion on scheduling applies to longhaul only (744/747/767) and not shorthaul (737). Qantas can schedule basic crews for a maximum of eight flying hours (block time). This is extended to 8 hours 30 minutes per pilot when augmenting, so a single-augmented crew may be scheduled to fly 12 hours 45 minutes. Dual-augmentation would permit 17 hours flying time, but, by agreement, is limited to 16 hours 30 minutes. Scheduled duty time limit for a basic crew is 11 hours, 14 hours for a single-augmented crew, and 18 hours for a double-augmented crew. Absolute actual duty time limit for a dual-augmented crew is 20 hours.

A basic crew is restricted to 30 block hours maximum in seven days and two local nights off before the pairing begins. These restrictions do not apply when they augment a flight; so even though adding a Second Officer to a flight may cost more, it increases scheduling flexibility. An augmented crew needs 12 hours free of duty before any augmented flight but union restrictions usually require two local nights off. Pilot scheduled pairings are reviewed by pilot union representatives to screen against onerous or fatiguing pairings. There are no scheduling restrictions involving home domicile time. There must be a minimum of 24 hours off before operating any long-range segment over 16 hours. Qantas has no crew pairing restrictions because Captains and First Officers have extensive international experience by the time they reach those positions on the 744.

Pilots use a preferential bidding system to make requests for their schedule. Longhaul schedules are built by computer according to seniority and are for an eight-week period. The computer builds individual pilot schedules to contain at least 155 hours with a target of 170 hours. Pilot flying time cannot exceed 100 hours in 30 days and 900 hours in 365 days. One day off at home after pairing is given for each two days in a pairing. Each eight-week pilot schedule must contain a minimum of 18 days off and any remaining unfilled days are called additional duty days. After the flying schedules are built, known training is placed into a pilot's schedule usually two weeks in advance. Training is normally scheduled on additional duty days, avoiding a conflict with pairings whenever possible. If training is accomplished on a day off or additional duty day, a pilot receives an additional four hours of pay.

Junior pilots receive a blank (reserve) line. Their eight-week schedule has a bid period (two months) of reserve duty and a bid period of flying pairings. This allows a reserve pilot to gain experience. For example, if 20 pilots are normally needed for reserve duty, Qantas doubles this amount (40 pilots) and alternately assign the 40 pilots a reserve bid period and a flying bid period so they always have 20 pilots on reserve at a time. Open pairings are assigned to reserves 48 hours before departure time in reverse seniority order adjusted when necessary to maintain recency. Pilots may trade a pairing with open flying up to 48 hours before departure time as long as it is legal and meets contract restrictions. This can allow a pilot to increase their pay. Reserve pilots may also bid to fly open pairings.

### Management of Currency / Recency Requirements

The main responsibility for maintaining currency is placed on the pilot, but the company also monitors pilot currency. The crew scheduler calls the pilot when landing currency is about to lapse so they may reach an acceptable solution and schedule the pilot for the simulator, if required.

Approximately eight Captains and eight First Officers lose their currency each month. Pilots who lapse currency generally fail the 35-day currency requirement. Much of this is a direct result of their vacation policy that allows pilots to elect a six-week vacation period. Pilots can fly a pairing even though they will lapse currency during the pairing as long as they update their requirements prior to lapsing. The Captain must approve a First Officer flying the pairing if they are about to lose currency. An autoland can be used to satisfy Captain currency requirements.

Currency requirements can be updated in the simulator, however every other 35-day recency must be accomplished in the aircraft. To prevent lapsing currency, some pilots will accomplish a takeoff and landing in the simulator while on vacation. Other pilots have scheduled a brief simulator session immediately before their pairing to update currency. A Training Check Captain must observe a Captain, or fly with a First Officer whose currency expired if between 35 and 56 days. A pairing dropped for landing currency is still paid in full. Once landing currency is re-established, the pilot may be assigned a pairing to cover the remaining days of the dropped pairing.

### **Experience**

The Captains and First Officers flying the 744 are senior. It currently takes 15 to 20 years with the company to upgrade to 744 Captain and about nine years to upgrade to 744 First Officer. By the time a pilot upgrades to 744 First Officer, they have extensive international experience, much of which was gained as a Second Officer. Some First Officers elect not to bid wide body Captain even though their seniority permits them to hold it. A pilot can remain a First Officer as long as they desire. It currently takes about two to three years for a Second Officer to be able to move to a First Officer seat but in the past it has taken up to 10 years. On dual- augmented sectors, First Officers get limited feedback or training during cruise from the Captain because they are not on duty at the same time.

The Qantas philosophy for Second Officers is that the position allows them to learn company procedures like fuel policy, low-visibility approaches, and international procedures without the responsibility of flying the airplane. When they upgrade to First Officer, they already know the company and international procedures, so all they have to do is learn to fly the airplane. A union representative said there was some concern that *ab initio* cadets with little flying experience are really learning to fly all over again when they upgrade to First Officer. On balance though, the company considers it better than having low time *ab initio* cadets going straight into a First Officer's seat.

### **Assigned Crew Duties**

#### Command Authority

The Captain is in command at all times. The First Officer is the acting Pilot-In-Command when the Captain is on rest break. When the Captain leaves the flight deck, the First Officer occupies the right seat because he is trained in that seat. A Second Officer may sit in either pilot seat and primarily performs cruise communication and navigation duties but his duties may also include FMC loading, aircraft walk around, ACARS loading, etc. The First Officer assumes the PF role unless the Captain is allowing a Second Officer to sit in the right control seat to practice flying above 5000'. When the First Officer is flying a segment, Captains usually permit the First Officer to make decisions as the Captain to gain experience. Either the Captain or First Officer must occupy a control seat at all times.

All crewmembers participate in flight planning. There is no requirement for augmenting Second Officers to be in the cockpit when not required to occupy a control seat. However, it is customary they will be present in the cockpit as safety observers for takeoff and landing. There are no other assigned duties for them when acting as safety observers. Captains may assign duties to the Second Officers as they deem appropriate.

Qantas uses a guide for the crew change briefing. Typically the Captain and First Officer exchange a briefing, and the augmenting Second Officers exchange a separate briefing. When seats are being changed during a change of duty, the autopilot and autothrottle must be engaged. There are no written guidelines for circumstances that require notification of the Captain during his rest break and crews rely on common sense to guide this matter. The Captain is required to be in his control seat for landing no later than 5000 feet AGL or before deployment of flaps.

## **Training**

### Base Training (Transition)

Base training follows a maneuver oriented (Appendix H) syllabus in simulators owned by the company. Qantas generally follows the Boeing procedures and syllabus. The syllabus is tailored for individual pilot experience and previous aircraft flown. Systems are taught in ground school with the use of CBT. Following ground school, trainees accomplish eight fixed-based simulator sessions. Full-flight simulator training consists of eight sessions including the check. Prior to line training, pilots have four LOFT sessions in the simulator. For First Officers upgrading to Captain, Qantas adds five to six simulator sessions for LOFT and CRM emphasis. Following transition, all initial First Officers fly in the aircraft for two hours for takeoff and landing practice.

Qantas has a wide variety of instructors. Non-flying ground instructors teach performance, FBS and systems. Non-flying simulator instructors are former pilots that primarily teach First Officer endorsement training. Training First Officers conduct most Second Officer training. Training Captains conduct line training. Check and Training Captains give line training and line checks. Senior Check Captains can give any training but primarily train Captains. As a standards check Qantas conducts every second recurrent simulator session with a Senior Check Captain.

### Line Training

B744 line training lasts four or five segments and is flown to Europe only. The pilot receiving line training flies as an additional crewmember with a complete crew. New Captains must accomplish the first twelve takeoffs and landings in the aircraft after completing line training.

### Cyclic Training (Recurrent)

Cyclic training consists of a one-day simulator check approximately every four months. CASA requires all simulator sessions to be graded. No warm-up sessions are provided. Qantas has re-introduced a fourth simulator session for 744 pilots to practice hand-flying skills. This would change the current program to a simulator session every three months (quarterly). It should be noted that Qantas originally had quarterly simulators but deleted the fourth simulator (which was used for LOFT) after initial AQP studies across their four aircraft types. The extra long sectors, especially across the Pacific, has caused the change for the 744. An annual line check completes recurrent training. The two-sector line check evaluates both pilot-flying and pilot-not-flying duties.

Cyclic training for Second Officers includes all of the events previously discussed plus a fourth simulator session. Second Officers are not evaluated in ground operations or terminal area procedures. Their main area of focus is cruise operations and emergencies. The Civil Aviation Authority requires Second Officers to fly an NDB approach to MDA in the simulator.

Second Officer cyclic training (called 280 series) also includes a structured series of handling skill enhancement and developmental exercises. The objective of the program is to introduce and train the Second Officer in the fundamental “manipulative techniques” that will be required during upgrade training to First Officer. Their training is individual, needs based; allowing everyone to progress at their own rate based on their experience and pilot skills. They also know in advance what maneuvers they will be working on during each simulator training session. This training includes topics for discussion with a Captain during line segments.

### Command Screening

Qantas has a formal command assessment and screening program for evaluating First Officers desiring upgrade to Captain. The assessment is based upon past performance on evaluations, piloting and CRM skills, personality traits, and other areas. First Officers in the top fifty percent (all related figures are approximate) of their peers are automatically approved for upgrade training. Pilots in the next forty percent are evaluated in the simulator during three LOFT sessions. Those who pass are approved for upgrade. The First Officers in the bottom 10% are judged not yet ready for command training. There is an appeal process for those who are not allowed to upgrade. First Officers are only allowed two opportunities to pass the command assessment or they will not be allowed to upgrade.

### QAR

Qantas monitors aircraft exceedance data with a Quick Access Recorder, or QAR. Data is de-identified and added to training programs to help prevent similar occurrences. Selected items are also published in newsletters to pilots.

## **Practice**

### Pilot Flying / Pilot Not Flying

The Captain and First Officer practice PF or PNF duties on every segment. This is because Captains and First Officers are in the control seats for every takeoff and landing since they do not share takeoffs or landings with the two relief pilots. Captains typically accomplish six landings and First Officers accomplish four landings during an eight-week period. Landing currency does not pose a major problem but even so, Qantas has reintroduced the fourth or handling simulator session for 744 pilots to maintain proficiency. All pilots may volunteer to fly the simulator without motion for extra practice on their own time. To help Second Officers retain their skills, Captains may allow them to fly the descent and approach to 5000 feet AGL.

### Autoflight Philosophy

Qantas encourages the prudent use of the autopilot based upon workload. Consequently, a large portion of both simulator and line flights are flown with the autopilot. Managers and pilots interviewed stated that more time should be allotted in the simulator for practicing hand-flying skills. Captains sometimes allow a Second Officer to load the FMC under supervision.

## **Physiological**

### Crew Rest Facilities

Crew rest facilities on the 744 are located in two individual rooms that contain a single first class style, fully reclining sleeper seat. The Captain/First Officer rest area is located adjacent to the cockpit while the Second Officer rest area is located at the aft end of the upper deck. A curtain separates the rest area from the flight deck, so there is limited noise protection. The cockpit has its own lavatory facility.

### Rest Breaks

Rest time is usually divided equally among all crewmembers. There are no specific rules for scheduling rest breaks. The crew is free to make a rest plan that can accommodate individual rest needs. In a double-augmented crew, the Captain and First Officer make their rest plan, while the Second Officers make their own distinct plan. Thus, individual rest may be a single long break or multiple shorter periods. Crewmembers interviewed reported that the initial rest plan could be modified on an “as needed” basis in the event a resting crewmember finds that he cannot sleep. For example, if a crewmember can’t fall asleep in the first hour of their break, they usually come back to the cockpit and allow the other crewmember to take an hour break and then they split the remaining time. A crewmember does not generally know in advance what his rest schedule will be, so planning before a flight is not usually available.

### Cockpit Napping

Controlled rest is permitted for a basic crew on flights over two hours in duration. There is published guidance as to how this may be accomplished. The Pilot-In-Command is responsible for the planning and utilization of controlled rest and considers airmanship, weather, workload, aircraft serviceability, and fatigue levels. Naps can be taken only in cruise and should not exceed 30 minutes per crewmember once per sector. Full briefings should occur before and after the rest period. The pilot not napping should use a fitted crew alerting system, otherwise, at the Captain’s discretion, refreshments should be pre-ordered.

### Fatigue Mitigation Training

Qantas provides no specific training to pilots on understanding and accommodating fatigue or on fatigue mitigation. However, their napping procedures are based on NASA research and they are currently working with US advisors, a local university and the Regulator, to establish new crew rest/duty hours policies, especially with the pending purchase of extra-long-range aircraft.

## **Motivation and Pilot Focus**

Pilot motivation is high. Crewmembers have a good camaraderie and working relationship. Qantas management seems to feel their pilots are motivated and remain highly focused on performing their pilot duties well.

Several people interviewed mentioned that pilots are motivated to stay proficient because they are evaluated and graded on their flying skills and command skills during line checks and recurrent simulator sessions. In addition, First Officers have to pass a preliminary screening process for command in order to upgrade to Captain. Pilots also like the ability to sign up for extra simulator time to work on skills without it being graded.

Second Officers maintain motivation but some expressed frustration if they have to spend more than three years at the job (often a pay issue). To provide experience and motivation, Second Officers are allowed to occasionally fly the airplane within the guidelines previously stated. Second Officers stated that this happens four to five times a year. Interviewed Second Officers and management stated the ongoing Second Officer cyclic training (280 series) keeps them motivated because it allows everyone to progress at their own rate based on their experience and pilot skills. Their training is individual needs based, and they know what maneuvers they will be working on during each simulator training session. Adding LOFT training for Second Officers has also increased motivation and pilot focus. A union representative and management said that Second Officer focus is generally good, but an experienced Second Officer can get bored. They even commented that permanent Second Officers can become de-motivated over a period of time but this was not general. Most are motivated to accomplish their current role and the company is trying to define their role better. Interviewed Second Officers who were hired with several thousand

hours experience would of course much rather be a First Officer after a few months. They thought staying as a Second Officer for a long-time was fine for *ab initio* pilots but not for more experienced pilots. However, they also said they could live with it if it did not last much more than two to three years. The company's view is that they all lack international or company or heavy jet experience and that two to four years is an essential learning process.

### **Performance Failure**

A pilot who fails an upgrade (e.g. First Officer to Captain) twice will remain at their old seat position. As a result, they have some permanent Second Officers and First Officers.

If a pilot fails an upgrade, they stay on the new aircraft in their old seat position (if they pass the transition course for that seat). They receive an equipment freeze of 12 months before they can try to upgrade again. For example, a 744 First Officer who fails to upgrade to 767 Captain becomes a 767 First Officer for the next 12 months.

First Officers are only allowed two opportunities to pass the command assessment or they will not be allowed to upgrade. They have a mentoring program for anyone who has failed a course, is having training problems, or has failed the command-screening course.



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## SINGAPORE AIRLINES

Singapore Airlines uses a dual-augmented crew on both the 744 and A340-300. Fleet size is 92 airplanes, comprising forty-four 744, fifteen A340, eighteen 777 and fifteen A310 aircraft. Singapore Airline's pilots are based in Singapore, with a very small number of 744 pilots based in London. Their 744 pilot force consists of 400 Captains and 410 First Officers. Their A340 pilot force consists of 120 Captains and 110 First Officers. Singapore Airlines uses two different methods for single-augmented operations. They add a fully qualified First Officer to extend the duty time limits by one hour and/or increase the number of sectors flown during a duty period. This is called a "3P" crew. For longer sectors, they add a fully qualified Captain. This is called an "augmented" crew. Finally, on their longest sectors, they add a fully qualified Captain and First Officer. This dual-augmented crew is called a "double" crew. Pilots cannot take a rest break unless the crew has two Captains.

Singapore uses their 744 and A340 aircraft on both short and long sectors. They also fly many tag-on sectors. This results in a mix of both basic crew and augmented flying. About 30% of the total 744 and A340 flight sectors are flown with only a basic flight crew. Approximately 70% of the flight sectors are augmented, with half of these using double crews.

Operations at Singapore Airlines fall under the authority of the Civil Aviation Authority of Singapore (CAAS). The CAAS requires all pilots to manually land the aircraft three times every 90 days. Additionally, a Captain is required to accomplish a takeoff and landing every 28 days. Singapore Airlines requires all pilots to fly in a cockpit seat every 28 days. All 744 and A340 Captains and First Officers are type rated and receive the same training. Captains maintain currency in the left seat and First Officers maintain currency in the right seat.

### Aircrew Management

#### Staffing

Singapore Airlines hires a mixture of pilots who have previous airline or military experience, as well as *ab initio* cadets. More than 60% of their newly hired pilots are *ab initio* cadets. They also have a significant number of direct entry pilots, most of whom are assigned as Captains. Newly hired pilots initial aircraft assignment is based on the needs of the fleets. *Ab initio* cadets complete an 18-month flying college, including jet experience in the Lear Jet 45. They are then trained as a second officer on the aircraft they will fly at Singapore Airlines. This phase lasts approximately nine months. As a Second Officer, the *ab initio* pilot flies as an observer crewmember but can fly at the controls when with a training Captain. Upon successful completion of this phase, he becomes a First Officer on the aircraft. Several management pilots reported they like the *ab initio* program because they can develop pilots within their company culture.

The normal career progression for First Officers is from the A310 or 777 to the A340 or 744 First Officer. A pilot's first appointment as Captain is often on the A310 or 777.

Singapore has a comprehensive system to evaluate pilots. Pilots are constantly evaluated and then ranked according to merit. Promotions are based on merit, rather than solely on seniority. Pilots are evaluated by Training Check Airman during training, checkrides and line checks. In addition, First Officers are evaluated on flights for command suitability and flying skills by instructors. Pilots are rank-ordered based on these evaluations and divided into two groups. The upper group comprises those whose ranking is above a moving average of all the candidates eligible for selection. Pilots in the upper group are selected before those in the lower group. Within each of the upper and lower group, pilots are then ranked on seniority.



Pilots receive a salary according to the aircraft they fly and the seat they occupy. Captains are paid more than First Officers regardless of the number of years with the company. Pilots receive a basic salary that is not tied to any guaranteed hours. In addition, a productivity allowance is paid for each hour flown, with a penalty rate of 1.5 times applying to the hours above 70 hours in a month, and four times for hours above 85 hours in a month. Pilots receive 28 days of vacation a year. Pilots must retire at age 60.

The industrial agreement (union contract) provides for two Captains and two First Officers for a dual-augmented crew, although the CAAS legal rules allows for dual-augmentation with a single Captain and three First Officers.

Singapore Airlines is currently discussing with the CAAS on an augmentation scheme and duty plan that will accommodate future longer-range aircraft with increased flying duty periods beyond that currently allowed.

### Scheduling

In building their pairings, the industrial rules (union contract) have a complex set of duty-time limits that guide aircraft staffing for long-range operations. Length of allowable duty time is predicated on departure time and number of sectors operated, as well as acclimatization. Duty time limits may be extended with the use of additional crewmembers (“3P”, “augmented”, or “double”). There are also extended duty-time limits for an “acclimatized” crew, which is one that has had three consecutive nights free of duty during a time window that permits consistent rest. The use of a 3P crew may also increase the number of sectors that may be flown during a duty period. For example, a basic crew can be scheduled to fly between 7 hours 30 minutes and 9 hours block and has a 9 hour to 12 hour 30 minute scheduled duty time maximum based on local start time and number of sectors in the day. A 3P crew can be scheduled to fly between 9 hours and 13 hours duty day maximum based on the local departure time and number of sectors. An augmented crew has a scheduled maximum of 12 hours 30 minutes to 14 hours duty day based only on local departure time. A double crew has a scheduled maximum of 17 hours 30 minutes duty day.

Contractual rules call for two local nights of rest at a turn-around station after operating a non-stop flight with an FDP exceeding approximately 12 hours. The scheduling of this rest is flexible within the pairing, in that it may occur after any sector of the pairing. Minimum time off between pairings is determined by their length. For example, a seven-day pairing requires three days off, an eight-day pairing requires four days off, and an 11-day pairing requires five days off.

Monthly schedules (patterns of pairings and days off) are built monthly, but rosters are published weekly for a rolling six-week period. Schedules are not bid but are equally rostered to pilots for sharing of pairings. Seniority is not considered when assigning monthly schedules. Equal rostering for flight time, layover location, and short and long pairing prevents complacency by not allowing pilots to fly to the same place all the time. The equal rostering of type of pairings help balance out the landing opportunities, but scheduling does not attempt this. Known training and pairings are pre-assigned into a pilot’s schedule. Pilots get an average of 10 to 12 days off at home base per month, with a contractual minimum guarantee of two days off per week. Pilots require management approval to trade pairings between themselves.

Most pilots receive a two-week reserve period two to three times per year. To ensure a minimum level of crew experience, not more than one pilot in a crew may have less than six months experience on the aircraft.

### Management of Currency / Recency Requirements

The pilot is responsible for maintaining landing currency, but the company also monitors pilot requirements. Neither the CAAS nor company requirements present problems for pilots. As a

result of route variety, schedule mix and pilot cooperation, pilots experience almost no lapses of landing currency. Also, flight operations management stated that they have an input to marketing to adjust scheduling of the type of aircraft to create additional landing opportunities. The only lapses noted were with the company 28-day recency requirements, primarily due to vacation or sickness. Autoland does not count toward landing requirements.

To determine which pilot will make the takeoff and landing, the pilots have a cooperative discussion led by the Pilot-in-Command. After determining the needs of each crewmember, the Pilot-in-Command decides who will fly the sector. On a long-range pairing, First Officers are relief one sector and are pilot-flying on the next. Typically, Captains accomplish 60 % of the landings.

Both CAAS and company requirements can be updated in the simulator. However, a currency lapse also requires a flight in the airplane with an instructor pilot. Simulator sessions for updating landing currency requirements are four hours in duration. Pilots must accomplish certain maneuvers, including both pilot-flying and pilot-not-flying duties.

## **Experience**

The experience level of pilots varies depending upon whether the pilot was hired as an *ab initio* cadet or as a direct entry pilot. Approximately 40% of Captains are direct entry pilots that have prior long-range Captain experience. These direct entry Captains must have 7,000 hours, a minimum number of sectors, come from a reputable company, and Singapore Airlines must be able to contact their previous company about their flying record.

The experience level of First Officers on long range aircraft varies from *ab initio* pilots with several hundred hours to pilots with thousands of hours. The average time spent as a First Officer is five to seven years for First Officers with prior experience to eight to ten years for *ab initio* First Officers. To be eligible to upgrade to Captain, First Officers need at least 4500 flight hours and a minimum number of sectors and years with the company. If they do not have the required number of sectors, they are scheduled to fly the LearJet 45 to make up the shortfall of sectors. New Captains (except direct entry pilots) normally start on short-range aircraft to gain experience.

## **Assigned Crew Duties**

The commander of the flight, or pilot-in-command (PIC), is specified on the schedule by the rostering section. On a two-Captain crew, the Captains can agree before the flight to change the PIC to accommodate individual needs. However, once established, the PIC does not change during that flight sector. The PIC has ultimate responsibility for the flight, even during his rest break. The relief Captain is authorized to take all immediate actions necessary during his duty as acting pilot in command, but is to defer all major decisions to the PIC. The PIC must be notified if an emergency checklist must be accomplished. If an instructor Captain is part of the crew, he may (but usually does not) take command of the aircraft from another PIC during an emergency. They rarely have CRM difficulties between Captains on the same crew since the roster designates a Captain as the PIC.

Singapore Airlines flies the 744 and A340 as a two-pilot operation. They have a very strict operating protocol, including requiring strict adherence to switch nomenclature and avoidance of jargon or slang. This is a result of having pilots with different native languages, cultures, and previous airline experience. There are no duties specified for relief crewmembers, although some Captains do make some use of relief crewmembers during pre-departure preparation. Except for the extra First Officer on a 3P crew, relief pilots are not required to be on the flight deck for any particular phase of flight. Augmenting pilots, if on the flight deck during takeoff, may only point

out problems or omissions; they may not make safety call-outs. All pilots assigned to the crew participate in the flight planning.

## **Training**

### Transition Training

Training at Singapore follows a maneuvers oriented (Appendix H) syllabus in simulators owned by the company. Transition training follows the Boeing footprint and lasts approximately six weeks. The syllabus is the same for all trainees with no regard for experience or previous aircraft flown. Systems are taught in ground school with the use of CBT. Trainees study systems five days a week for three weeks. Simulator training consists of fifteen sessions. The first five sessions are taught in a Cockpit Procedural Trainer while the remaining ten sessions are in the full flight simulator. Pilots who do not qualify for Zero Flight Time training fly in the airplane for approximately one-and-one-half hours to accomplish landings. All instructor pilots are Captains. The Senior IP conducts both simulator and aircraft training, carrying out approximately three weeks of simulator training and then fly the line for three weeks. Line IPs conduct aircraft training only.

### Line Training (OE)

Line training lasts approximately five to six weeks. Captains must fly to all theaters of operation and also into several compulsory airports. First Officers are not required to fly any particular routes and finish after 10 to 12 sectors. A two-sector check completes line training.

### Recurrent Training

Recurrent training consists of four, one-day simulator sessions per year. Two of the simulator sessions are checks and are scheduled six months apart. The other two simulator sessions are refresher training and are scheduled approximately three months before each check. The refresher training simulator lessons are designed on a three-year cycle. Three lessons involve LOFT while the remaining three are maneuver oriented. Two pilots are scheduled for each simulator session of four hours in duration, with a one-hour briefing and half-hour debrief. No systems oral is given unless instructors suspect an obvious weakness. A two-sector line check completes recurrent training.

FOQA data is monitored for trends. Information is shared at a meeting scheduled with the fleets three to four times a year and with the pilot group two times a year. Training is updated for trends if needed.

### Command Training

Command training is given to First Officers upgrading to Captain. It consists of seven different phases and lasts approximately nine months. Following endorsement of the license (transition training), command trainees fly 25 sectors of line training with a Senior IP to become comfortable flying the aircraft. For the next 25 sectors, they are taught how to manage the flight. The next 25 sectors are for assessment and critique. Next is LOFT training and evaluation followed by 25 sectors of instruction with an assessment by an IP and a management pilot. Command training ends with a base check, a final LOFT, and a management check.

### Mentor Program

Singapore has a mentor program for new-hire pilots and new Captain trainees while they are in training. Trainees are assigned a mentor for help in training or for advice with other issues and

problems. This program gives the pilots an avenue of regular support and also permits them to bring problems to the attention of the training department while remaining anonymous.

## **Practice**

### Pilot Flying / Pilot Not Flying

Captains and First Officers sit in a control seat as PF or PNF every other leg. The Captain who is Pilot-in-Command decides who will fly each sector based on the needs of each crewmember. Captains average approximately six to seven landings per month while First Officers average about three to four landings.

### Manual Flying Skill Retention

Singapore Airlines instituted a self-help program to help pilots maintain their flying skills. This program allows pilots to pick-up a simulator session on their own time when the simulator is not being used for training. Pilots are taught to operate the simulator without an IP so they can fly and practice maneuvers and procedures on their own. This program initially started out for First Officers, but has proven to be so successful that they have even had Captains sign-up for additional simulator sessions. During line operations, pilots are encouraged to occasionally hand-fly the airplane to help maintain skills. In the simulator, instructor pilots have trainees hand-fly emergencies for handling skill practice. They do, however expect pilots to use the autopilot if they encounter an emergency during actual flight operations.

## **Physiological**

### Crew Rest Facilities

Pilots have an enclosed bunk area with two horizontal beds for sleep and a business seat in the cabin for each augmenting crewmember to permit non-sleeping rest.

### Rest Breaks

There are no specific rules to determine how rest breaks are scheduled. Company guidelines suggest that landing crewmembers be in their control seat 30 minutes prior to top-of-descent. As a general rule, with the double crew, the portion of flight from top-of-climb to 30 minutes prior to top-of-descent is divided in half and split between the basic crew and the relief crew. With an augmented crew, the available rest time is divided in thirds. Since rostering designates the flying assignments, pilots know prior to the flight when their rest break will occur and can plan for it. On a 3P crew, there are no rest breaks and all three crewmembers remain in the cockpit for all phases of flight. The purpose of adding the additional First Officer is not to provide relief but to increase vigilance and crew stimulation.

### Cockpit Napping

Cockpit napping is not officially recognized by the company.

### Fatigue Mitigation Training

There is no formal training on fatigue or fatigue mitigation. However, useful information on circadian rhythm, fatigue, fatigue mitigation, etc. is distributed by the company to the pilots via periodic newsletters.

## **Motivation and Pilot Focus**

Pilot motivation is high. They share a good working relationship with other crewmembers. Singapore management feels there is no pilot focus problems at the airline. Pilots are motivated to do their best when they show up to work. One reason could be that their promotions are based on a merit system and not seniority. Also, if a pilot demonstrates consistently poor performance, his employment may be terminated or his contract not be renewed, as applicable. Since pilots usually fly in a control seat as PF or PNF every other leg, they maintain good focus and motivation. Finally, their rostering system, which allows pilots to share duties and fly to various destinations, also helps with motivation and reduces complacency.

Pilots can use the simulator during free time to improve skills and practice. This improves motivation because they are able to work on their skills to possibly help improve their ratings. Interviewees say extra simulator time helps pilots stay motivated.

### **Performance Failure**

If a First Officer fails upgrade training, he returns to his previous seat and aircraft. A line Captain or instructor can identify and recommend training for a pilot who has proficiency problems. The pilot receives extra simulator training followed by a line check.

The facts represented in this report were collected by our team for the purpose of this study. Every attempt was made to ensure the report contains factual information. However, in some cases, the facts may not represent the official view of the air carrier, union, or pilot group.

## **UNITED AIRLINES**

United Airlines dual-augments on the 744. Their 744 fleet consists of 44 aircraft. United has five pilot domiciles located in Los Angeles, San Francisco, Chicago, New York City, and Honolulu. They have approximately 380 Captains and 800 First Officers flying the 744. United Airlines single-augments with an additional First Officer and dual-augments with two additional First Officers.

United Airlines predominantly uses the 744 to fly long-range routes. However, they also fly a few shorter-range flights within the Pacific region and some domestic flights. Approximately 79 % of the flight segments on the 744 are dual-augmented and approximately 12 % are single-augmented.

The U.S. Federal Aviation Authority (FAA) regulates flight operations at United Airlines. All Captains and First Officers must accomplish three takeoffs and landings every 90 days. This currency requirement can be satisfied in either the airplane or the simulator. Additionally, United's FAA Operations Specifications requires all First Officers to accomplish a minimum of four segments (take-off and landing) as PF or PNF every 180 days, at least one of which must be as PF. All 744 Captains and First Officers are type-rated. Captains maintain landing currency in the left seat and First Officers maintain landing currency in the right seat.

### **Aircrew Management**

#### **Staffing**

United Airlines hires pilots from the military, general aviation, and other airlines. Approximately 40-45% of the newly hired pilots are from the military, while the remainder are from general aviation and other airlines. The average experience of newly hired pilots is approximately 3500 hours.

Aircraft type and seat are awarded based on seniority. A pilot may change equipment or seat assignments anytime his seniority position is sufficient to obtain a vacancy award as long as he does not have a bid restriction. There is no requirement to change aircraft or seats at any particular time or follow any specific progression in aircraft type. Pilots who are awarded a new equipment vacancy may not be awarded another vacancy award for 27 months. This restriction or "freeze" is reduced if the pilot requires a short training course. A pilot may upgrade his seat position any time, even if he has a bid "freeze". However, any remaining freeze from the last award is added to the new freeze. A narrow-body Captain may bid back to First Officer. This is not uncommon and usually occurs for lifestyle and pay. Once a pilot bids Captain on a wide-body aircraft, he may not bid back to First Officer.

Pilots are paid based on seat position and equipment type. Pay for equipment type is based on the gross weight and speed of the aircraft. They also receive longevity raises during the first 12 years. Pilots are paid a minimum of 78 hours per month, and may normally fly up to 85 hours maximum per month. They may exceed 85 hours if they have a trip that departs near the end of the previous month and extends into the current month. Vacation is accrued by longevity. 744 pilots receive between 14 and 44 vacation days per year. Captains usually have 44 vacation days per year and First Officers typically have between 21 and 44 vacation days per year. Vacations are assigned based on seniority and can be taken in a single block or split into a maximum of three periods of seven days or more.

Pilots normally retire at 60 years old, but may elect to continue to fly as a Flight Engineer on a three-pilot aircraft past this age.

## Scheduling

FARs require a single-augmented crew for flights scheduled over eight hours block time and a dual-augmented crew for flights scheduled over 12 hours block time. The pilot's working agreement (contract) requires an augmented crew be used in both directions of a pairing even if flight time requires an augmented crew on only one segment. The contract also requires that all Atlantic crossings be augmented irrespective of flight time.

A non-augmented flight may be scheduled for a duty period of between 9.5 hours and 13.5 hours, dependent on the time of day the duty period begins. Single-augmented flights can be scheduled for a maximum of 13.5 hours duty time with no restrictions. Dual-augmented flights may be scheduled to a maximum block time of 16 hours and a maximum duty period of 17 hours. As a general rule, actual duty periods may exceed these schedule limits by two hours.

The length of scheduled layovers within a pairing is based on contractual schedule rules and frequency of service. Typically, this results in a layover of approximately 26 hours. While this is nominally in excess of contractual requirements designed to mitigate fatigue, it is driven by the airline schedule of service, not fatigue considerations. Pilots receive a minimum of 24 to 48 hours off at their home domicile at the conclusion of a pairing, depending on the theater of operation and the duration of the pairing. Furthermore, pilots are contractually guaranteed a minimum of 12 days off at their home domicile per month. Schedules are built to conform to these requirements as well as monthly flight time limitations. Because of the flight time accumulated on long-range flights, pilots in augmented operations generally have significantly more days off per month than the minimum required.

For First Officers, trip pairings are built that distinguish between the "flying" First Officer and the "relief" First Officer. The First Officer that is paired with the Captain is considered the "flying" First Officer and will normally occupy the right control seat during all takeoffs and landings for the pairing. The two "relief" First Officers each have their own pairing and their duty is to relieve the Captain and "flying" First Officer during cruise. As a rule, the relief pilots do not occupy a control seat during takeoff or landing on a pairing where they are considered "relief" First Officers.

Pilots bid on pre-built monthly schedules. Schedules are awarded based on seniority and availability. All pilot schedules have a minimum of 12 days off per month. Training assignments are placed in a pilot's monthly schedule after it is awarded and may be on days off or during the days of a trip. Training on days off is compensated with extra vacation days the following year, whereas training requiring a trip to be dropped is pay protected for the lost flying. First Officer monthly schedules may include both flying First Officer and relief First Officer trip pairings. Schedulers do not try to distribute landings equally among the monthly schedules. Scheduling goals are to equitably distribute flight time and days off. There is some effort to place a flying pairing in every First Officer schedule. A dynamic list of open flying is available via computer, and pilots may trade trips in their schedule with open trips as long as contract legalities are preserved. They may also trade trips between one another by working with crew scheduling. Trades may be made exchanging "flying" and "relief" assignments, unless a lapse of currency will result.

Reserve duty is built into month-long schedules that provide 12 days off a month. Reserve lines are awarded by seniority. Normally the junior pilots at each domicile receive reserve schedules. It is common for the very junior pilots to be on reserve for an extended period, perhaps a year or more at a time. For international trips, schedulers try to assign a reserve to an open trip in "First-In, First-Out" (FIFO) order approximately 48 hours before the trip is scheduled to start.

The FAA requires at least one member of the crew to have more than 75 hours experience in aircraft type. To satisfy this requirement, United only checks the experience of the two pilots assigned as the "flying" crew, they do not check the experience of the relief First Officers.

## Currency

Crew scheduling is responsible for tracking and assuring pilot currency. They provide assistance to help pilots remain current. To aid both the crew scheduler and the individual pilot in maintaining awareness of when a pilot's landing currency will lapse, the electronic (computer) version of the pilot schedule denotes the date currency expires. Furthermore, the date of each pilot's last three landings appears on the flight planning paperwork for each flight. While the individual pilot is encouraged to avoid lapses in currency, their only responsibility is to notify the crew schedulers if they are not current and not fly a trip if their currency has lapsed. Most pilots notify the schedulers in advance so a landing class can be assigned. The Crew Schedulers also monitor the pilot's 180-day recency requirements and will assign a training session if needed.

First Officer schedules contain pairings that are designated with either flying or relief duties. Some First Officer monthly schedules contain all or predominantly "flying" pairings while others contain all or predominantly "relief" pairings. Since the monthly schedules are assigned according to seniority, First Officers on the 744 do not share takeoffs or landings. Instead, a culture has developed where each pilot flies the pairings as awarded. This results in the junior First Officers flying predominantly relief pairings while senior First Officers sit in a control seat almost every time they fly. The Pilot Union and Crew Scheduling have a new agreement to help alleviate this inequitable distribution of front seat flying opportunities by attempting to place a flying pairing in every First Officer schedule. However, there are still a large number of First Officer schedules that do not contain a flying pairing. United Airlines recently instituted 180-day recency requirements which provides some practice opportunities for First Officers who are not senior enough to get flying schedules. In a typical schedule, the Captain will fly as PF for approximately half the take-off and landings, and the remaining half will be flown by the First Officer with the flying schedule, unless a relief First Officer needs a PF or PNF event to satisfy recency requirements.

Because of a more pro-active involvement by the pilots and the crew schedulers, the number of 744 First Officers who lapse the three landings in 90 day currency each month has fallen to zero or 1 per month. In addition, approximately 73 First Officers on the 744 require simulator training each month to avoid lapsing. To maintain or retain currency, training is provided that consists of a systems briefing and a four-hour simulator session which includes three full-stop landings. One landing must be in a crosswind. Engine failure on take-off, engine-out approaches and landings, and SPOT are also accomplished. Approximately three 744 First Officers per month lapse the 180-day recency requirement for not obtaining the required 1 takeoff and landing as PF. These First Officers must attend a landing class and then fly two segments with a Line Check Airman to regain their currency.

## **Experience**

Captains flying the 744 at United Airlines are very senior. A pilot is able to fly as a 744 Captain after about 22 years with the company. Most First Officers are also very experienced and their time at United ranges from 1 to 35 years, with an average of about 15 years with the company. In the past, many 744 First Officers have elected to stay on the airplane for a long time and were very experienced in the operation. Some even elected to down-bid to 744 First Officer after flying as a narrow-body Captain. Recently, 744 First Officer positions have been awarded to pilots with less than one-year UAL experience. This causes the overall experience level on the 744 to decline.



## Assigned Crew Duties

Since there is only one Captain, there is never a change of command during the flight. Company policy requires the Captain to select a First Officer to be the acting pilot-in-command while the Captain is off the flight deck. The acting pilot-in-command is authorized to take action as necessary during the Captain's absence but must notify the Captain in certain circumstances.

United Airlines does not operate the 744 strictly as a two-person aircraft, but rather as a two, three, or four-person aircraft depending on the number of pilots required for a particular flight. Along with the Captain and First Officer, augmenting crewmembers have published specified duties to perform during pre-departure and flight. Some pilots have become dependent on these additional crewmembers. United Airlines requires augmenting crewmembers to be in their observer seats during departure below FL180 and during arrival at least 30 minutes prior to landing or when below FL180 until the crew briefing is complete at the gate. All four crewmembers participate in pre-flight planning.

## Training

### Qualification (Transition) Training

United Airlines conducts Qualification training in accordance with the Advanced Qualification Program (AQP). This is an integrated, phased validation, LOFT oriented syllabus. All training is conducted on campus in five simulators owned or leased by the company. The course lasts 30 days but former glass-qualified pilots can omit the first five days. Aircraft systems and international procedures are taught using CBT. Systems and initial FMS procedures are taught in an integrated fashion during four sessions in the FANS Autoflight Trainer (FAS). All normal, irregular, emergency, and advanced FMS procedures are taught in four Fixed Base Simulators. Full flight simulator sessions cover eight lessons, with five devoted to Special Purpose Operational Training (SPOT) and three emphasizing LOFT. SPOT consists of training on all aircraft critical maneuvers and items of fleet emphasis including FOQA incidents or specific practice items such as unusual attitudes and windshear. The final check is given as a LOFT scenario. Academic Instructors, who are not UAL pilots, teach ground school and procedures training. Pilot Instructors (UAL First Officers) teach in both the FBS and full flight simulator. Check Airmen (UAL Captains) give checks in the simulator and the aircraft, and conduct OE and line checks. Line Check Airmen also conduct OE and line checks.

### Operational Experience (Line Training)

Operational Experience (OE) generally consists of a minimum of four legs (segments) and 25 hours flight time. United does not require specific route qualifications and new 744 pilots are not required entry to any specific theaters of operation. If a pilot has had difficulty in training or is upgrading to Captain, he requires six legs minimum.

### Continuing Qualification (Recurrent) Training

Continuing Qualification is divided into two parts: Proficiency Training (PT) and a Proficiency Check (PC). The two-day PT is scheduled approximately six months after Qualification. The PT is for training only and does not include a check. A pilot who has deficiencies that cannot be trained to proficiency by the end of the second day, however, will get additional training. The first day includes a two-hour review of operational issues and aircraft systems, and then a three-hour FBS session emphasizing FMS procedures. The second day consists of a one-hour, 30-minute briefing on critical maneuvers followed by a four-hour simulator session for SPOT. The PC must be scheduled approximately one year after the pilot

finishes Qualification (six months after the PT) and lasts three days. It concludes with a check. The first day consists of evacuation and ditching training and a two-hour, 30 minute LOFT in the simulator. The second day is the completion of evacuation and ditching training, a briefing on critical maneuvers, and then a four-hour simulator session for SPOT. The final day starts with an oral exam on aircraft systems and follows with a four-hour simulator session for the LOFT Oriented Evaluation and SPOT. Captains also receive a random or scheduled biannual line check in the aircraft.

## **Practice**

### Pilot Flying / Pilot not Flying

The 744 Captains take 55% of the landings and average two to three landings per month. The total landing opportunities available for the First Officer averages 1.4 landings per month. Actual landings for First Officers range from zero to eight per month, depending on their schedule. The delineation of a pairing as “flying” or “relief” for First Officers and the rigidity with which this is maintained among the pilot cadre has a significant impact on how often First Officers practice PF or PNF duties. Typically, the flying First Officer will have a full month as the flying First Officer and will get a PF or PNF opportunity on nearly every segment. In contrast, a First Officer with a relief assignment, again commonly a month-long assignment will only get a PF or PNF opportunity when needed for currency. There have been instances in the past when First Officers who consistently flew relief schedules would not fly as PF or PNF for months in the aircraft, repeatedly updating their 90-day currency in the simulator. The new 180-day recency requirement now precludes pilots from exceeding 180 days without getting some practice as PF and PNF. Currently, 744 First Officers average about 13 PF or PNF segments every 180 days, with the 100 senior First Officers averaging about 28 PF/PNF segments every 180 days and the 100 junior First Officers averaging about 4 PF/PNF segments every 180 days.

### Autoflight Philosophy

Pilot training emphasizes the use of autoflight to its fullest extent in all phases of flight. However, pilots are encouraged, when conditions permit, to hand fly the aircraft and to utilize raw instrument data. Hand flying is common during the initial portion of the departure and climb and during the latter portion of the descent and approach, with a wide range of practices. During landing classes, manual flying is emphasized and the use of the autopilot is discouraged.

## **Physiology**

### Crew Rest Facilities

There are two horizontal bunks in a room adjacent to the cockpit. The room has a solid door that separates it from the cockpit. The bunks have a separate privacy curtain, a reading light, and an audio entertainment headphone jack. There is one business-class type seat in the cockpit. There is not a separate lavatory dedicated for crew use. However, the crew may lock the lavatory located just outside the cockpit door by using a button in the cockpit. This precludes a passenger from entering the lavatory until the button is released by one of the pilots.

### Rest Breaks

There are no specific company guidelines for scheduling crew rest. The custom that has evolved is for the cruise portion of the flight to be divided into two equal parts, with the relief First Officers taking the first rest period and the operating crew the second break. The flying crew returns from rest one hour prior to landing to fly the descent, approach and landing. This arrangement allows crewmembers to know their expected rest schedule in advance so they can plan for it.

### Cockpit Napping

Cockpit napping is not permitted by the FAA on aircraft with only two pilots.

### Fatigue Mitigation Training

There is no formal training on fatigue and fatigue mitigation. This topic is occasionally addressed in company and union newsletters.

## **Motivation and Pilot Focus**

While job satisfaction of most United 744 pilots appears to be relatively high, high motivation among First Officers is not always in evidence. It is understandably difficult for First Officers whose seniority only permits them to bid relief schedules and where their flying may only rarely include a PF or PNF opportunity to maintain their motivation and pilot focus. It can be a difficult conflict; the job as First Officer on the 744 pays very well and permits a very nice lifestyle, but possibly at the expense of job satisfaction. Nonetheless, most crews function in a cooperative, effective and professional manner.

## **Performance Failure**

United Airlines flight training management has a comprehensive program to deal with training problems called the “Enhanced Pilot Training and Proficiency Decision Policy.” This

program addresses the specific needs of the individual. It is supported by the pilot union, which has an active role in its implementation. A description of the program follows.

### Enhanced Pilot Training and Proficiency Decision Policy

United Airlines continually strives to improve the training, assessing, and monitoring of pilot proficiency. Most recently with the development of AQP, the concept of training has been changed to address the proficiency issues of pilots by providing more focused directed training. Our data analysis has identified several areas where we see opportunities to improve the training for line pilots.

Over the years the process by which pilots are handled once they have been identified as having multiple training difficulties has varied. However, our Extended Monitoring policy has always been required for pilots who have had:

- Two or more events during training
- Two or more instances of unacceptable performance within a three-year period

We are confident that these triggering events are accurate in assigning pilots to extended monitoring. However, the system has been less accurate in defining when additional training will not improve the success rate for these individuals. We do know that each individual pilot is different and requires a special program. However, we also have learned that pilot training problems tend to cluster in specific areas. Therefore, for pilots with the same types of training problems, our use of the same training footprint should be effective and maximize the chance for these pilots' success. However, once this training system has been applied to the pilot, and there is still no improvement in their proficiency, there must be a consistent standardized process for decisions concerning the pilot's career. This new process is defined as the Enhanced Pilot Training and Proficiency Decision Policy. The elements of the policy are as follows:

- Each United Airlines Flight Officer is ultimately responsible for achieving and maintaining his or her own proficiency. If assistance is necessary to maintain proficiency Pilot Proficiency Monitoring will be implemented jointly by the Fleet Captain and Domicile Chief Pilot.
- If an Extended Monitoring pilot, Special Tracking pilot, or a pilot during training continues to exhibit serious proficiency deficits (successful completion is in doubt) a Performance Review Training Committee will meet to discuss the pilot's situation. Serious Proficiency deficits or successful completion in doubt are defined as:
  1. Transition/Qualification - After 2<sup>nd</sup> additional training period 2<sup>nd</sup> validation failure, or after rating/check/LOE failure.
  2. Operational Experience (OE) - After 38 hours of non-reduced OE requirements
  3. PC/CQP - After 2<sup>nd</sup> additional training period or after check/CQLOE failure.

Initially the Fleet Captain, ALPA Training representative, and the Domicile Chief Pilot will consult with the Human Factor Manager to validate the following three questions have been answered.

1. Was the training proper?
2. Was the environment proper for effective learning?
3. Was the assessment of the pilot fair?

If the answers to these questions are yes the Performance Review Training Committee will be convened.

- Performance Review Training Committee :
  1. Instructor/Evaluator (Advisory Capacity)
  2. Fleet Captain or Representative
  3. Domicile Chief Pilot or Representative
  4. ALPA Training Committee
  5. Medical Director and Regional Medical Director consultative with the Manager of Human Factors
  6. Human Factors/Performance Assessment
- The initial board of review will meet and determine the fairness of the pilots' training or evaluations to date, and if any other areas need to be addressed. The board will also consider short-term additional training goals if applicable, and long-term proficiency goals for the individual. The board will prescribe up to the following maximum of additional training events:
  1. Transition/Qualification: - After total additional training equal to 7 extra periods, up to 100% beyond normal scheduled periods for each validation point, 3<sup>rd</sup> validation failure, or 2<sup>nd</sup> rating/checking/LOE failure.
  2. Operational Experience: - After 55 hours of non-reduced OE requirements
  3. PC/CQP: - After 5<sup>th</sup> additional training period or after 2<sup>nd</sup> check/CQ-LOE Failure.
  4. The training program the board prescribes will be monitored by detailed quantitative assessment of the pilot by a selected, trained group of instructors/evaluators. If failures and training difficulties continue to the maximum events allowed and the quantitative performance information indicates no improvement there will be another review conducted. This final review committee will be the System Chief pilot, Domicile Chief Pilot, Fleet Captain, Legal and Labor Relations representatives, the pilot with an ALPA representative if she/he wants, Medical Director, Manager of Standards (Bid Restriction)/Human factors/Performance Assessment, and the VP of Flight Standards Training. The purpose of this committee is to determine the course of action for the pilot. The Enhanced Policy Final Review Committee will ensure the pilot was treated as fairly as possible. If the Committee finds this true, the group will discuss with the pilot his/her future options with United, some of which will require his/her removal from flying status.
- A pilot would only be allowed in the enhanced pilot training and proficiency decision policy a total of three times during their career at United Airlines. The only exception, would be considerations made for significant life events taking place, which impacted the pilot's ability to perform.

## **Gems**

### Total Airline Pilot (TAP)

United Airlines recognizes that the Captain is not just a skilled operator of a machine, but a manager in a complex system and in the delivery of travel service to the customer. United Airlines has recently instituted a command development course called "Total Airline Pilot" to provide command training to First Officers upgrading to Captain. United Airlines defines the "Total Airline Pilot" as a safe aviator, who is a customer-focused, team-oriented asset manager. This training is divided up into several sessions and is completed by the eighth month after a First Officer receives the initial Captain bid. The first training session is given prior to the pilot attending

Qualification training and consists of such things as leadership traits, decision making, customer focus, conflict management, and crew management. The emphasis is on developing Captains skills in command, managing assets, and total system awareness. The remaining sessions are given after the OE and help introduce line-unique training experiences and establish a stronger foundation of Captain skills.

## PART 3 – CONCLUSIONS AND RECOMMENDATIONS

### Introduction

A crew augmentation system consists of much more than just the number and types of pilots. A crew augmentation system is an integrated system that should include the following aspects of augmented operations:

- Experience and qualifications of the pilots (Captain, First Officer, Relief Pilot, etc.)
- Initial training pilots receive to prepare them to fly long-range operations
- Training that supports the augmentation system
- Specific assigned duties of the pilots
- Roles and responsibilities of pilots during in-flight contingencies
- Timing and coordination of rest breaks during a flight
- Alertness of the crew and thus their ability to make a quality decision
- Scheduling of pilots as it affects their opportunity to act as either PF or PNF
- The means of maintaining proficiency and currency
  - Through line flying and simulator training opportunities
  - Through practice of PF and PNF skills on a frequent basis

It is difficult to choose the airline with the best augmentation system not only because they are different, but also because they were developed within individual airline cultures and adjusted to fit their needs. Each airline has molded their augmentation system to take advantage of their strengths and minimize their weaknesses. As a result, another airline's augmentation system may not take advantage of United Airline's strengths. Instead, this committee has sought to develop a single, consistent philosophy regarding the aspects of crew augmentation outlined above. The goal of this philosophy is to better manage pilot proficiency and thus flight safety. In a following section, we recommend an augmentation system for UAL using a consistent philosophy of an integrated augmentation system. This philosophy is based upon the findings gathered and the interviews conducted during the airline visits. This committee is focused on the singular issue of crew augmentation systems and their potential impact on flight crew proficiency and ultimately the safe operation of our flights. ***All of our recommendations will be presented from the viewpoint of pilot proficiency and flight safety.*** Support for our recommendations comes from our visits to the airlines, the surveys, and the telephone interviews.

After the augmentation system recommendation, we will present a number of individual recommendations that can be used to improve our augmented operations. These recommendations are grouped according to our model of pilot proficiency. As a review, the "Profile of Proficiency" model states that a pilot's proficiency on an augmented crew is affected by the following:

- Aircrew Management
- Experience
- Assigned Crew Duties
- Training
- Practice

- Physiological Factors
- Motivation and Pilot Focus
- Performance Failure

In some proficiency categories, several recommendations for one topic have been made to improve proficiency but it was not possible for the committee to recommend one over the others. Sometimes there was no obvious solution that allowed the committee to make a unanimous recommendation for improved proficiency. Further, many recommendations are interrelated and need to be analyzed together because if one is changed, others may be affected. For example, if an “Assigned Crew Duties” recommendation is adopted that allows the crew to decide during the crew briefing the pilot performing the takeoff and landing for the segment, this recommendation might conflict with a recommendation in “Physiological Factors” that states the crew should know their rest break schedule before they show up for the briefing. Finally, the committee felt that tests must be performed for specific recommendations to determine their effectiveness in increasing proficiency and safety, to assess their acceptance in UAL culture, and to receive feedback from the participants. The recommendations selected and implemented by UAL and ALPA will depend on:

- The overall UAL philosophy established for long-range operations
- The relationship between recommendations of different proficiency model components
- The results of any testing performed

### **Augmentation System Conclusions**

As a result of the airline visits and subsequent analysis of their augmentation systems, the team determined there were common components in all augmentation systems that had the greatest impact on pilot proficiency and safety. These components are:

- Skills Maintenance through PF and PNF practice
- International Long-range Experience
- Scheduling
- Command experience of the PIC and relief PIC during all phases of flight
- Training
- Alertness of the crew

We believe these components are the essential components of the best overall augmentation system. In order to have the greatest impact on pilot proficiency and safety, the effectiveness of each component must be maximized. An explanation of each component and how it can be maximized follows.

#### Skills Maintenance through PF and PNF practice

**This group concluded that practice and frequency of practice of PNF duties was almost as important to overall pilot proficiency as accomplishing takeoffs, landings, and other PF duties.** Therefore, PF and PNF opportunities should be distributed more equitably to all pilots in an augmented fleet. This is essential if the proficiency of the entire pilot group assigned to a fleet is to be maintained. Additionally, the frequency of practice is very important. The augmentation systems that provided the most practice opportunities with the least



amount of time between frequency of practice for four fully qualified pilots were the systems that used two Captains and two First Officers.

#### International Long-range Experience

**The pilot's total experience is very important to safe operations.** Also, the more experience a pilot has in the theater they are operating in, the better they will be able to draw from their experience to cope with contingencies that arise. Pilots who fly international operations should have a higher minimum level of total flying experience. An exemplary OE (line training) is also important in providing the proper initial level of international experience.

#### Scheduling

**Scheduling techniques should be adopted that allow all pilots opportunities to practice.** Extended periods of reserve without flying in a control seat, particularly for pilots new to the aircraft, degrades their proficiency and may potentially impact the safety of a flight. Also, scheduling techniques should be adopted that verify the experience level of all pilots assigned to the crew, not just the pilots occupying the control seats for takeoff and landing.

#### Command Experience of PIC and relief PIC during all phases of flight

**The Pilot-in-Command is the key to the safe operation of a flight. His command experience is the essential ingredient during contingency operations.** However, fatigue may reduce the effectiveness of a Captain, affecting his leadership and decision making skills. The qualification, experience, and training of the relief PIC must encompass both normal and contingency operations. Dual-augmentation staffing must consider the need for an experienced and alert commander under adverse circumstances, including back-of-the-clock flying, extended duty periods, and non-normal operations. For these reasons, at least two pilots with command experience are required for long-range flights. This is necessary since a single PIC cannot be expected to make a quality decision if he has been on duty for an extended period of time. For example, if an emergency should arise 10 hours 30 minutes into a flight and the airplane is more than three hours from an alternate landing site, a second pilot who has enough international and command experience to safely command the flight is needed. The previous pilot cannot stay on duty for another three hours and still be alert enough to make all the proper decisions. This problem is magnified on longer duration flights or if the flight departed during the night, and the Pilot-in-Command operated the first shift.

#### Training

**Pilots flying long-range flights must be trained well above the minimum acceptable proficiency level to allow for proficiency stagnation and loss.** Proficiency loss is inevitable since practice opportunities are few. A pilot who is initially trained to a higher level will be able to cope with proficiency loss better than those trained to the minimum level. A pilot trained to the minimum proficiency level will fall below the minimum acceptable safe level when their proficiency declines. Our findings also indicate that more experienced pilots can tolerate fewer practice opportunities better than less experienced pilots. As a result, the proficiency of more experienced pilots will probably decline at a slower rate than pilots with less experience.

#### Alertness of the crew

**A rest break schedule should be established that ensures the pilots at the controls are rested and alert.** Rest break schedules should be determined based on scientific data that addresses circadian rhythms and body time. Rest break facilities must allow

uninterrupted horizontal rest. A quality rest break may be as important as the length of the rest period. Pilots indicated they are able to rest better when pilots on the flight deck are more experienced. A rest break that is known in advance, through scheduling or other means, may provide a better opportunity for rest.

### **Criteria in Determining the Safest Augmentation System at United Airlines**

Determining the best augmentation system to use is no easy task. As a result of the airline visits, however, the team concluded the best system should meet certain criteria. The first criterion demands that an augmentation system have certain components. By maximizing these components, the best augmentation system can be found. Second, an augmentation system does not stand-alone but must fit into the demographics and culture of the airline. Finally, the best augmentation system should minimize the risks for any route flown.

The essential components that comprise the best crew augmentation system were discussed in the previous section. When these components are maximized, the best augmentation system can be achieved. For review, these components are:

- Skills maintenance through PF and PNF practice
- International long-range experience
- Scheduling
- Command experience of PIC and relief PIC during all phases of flight
- Training
- Alertness of the crew

An augmentation system must also fit into the demographics and culture of the airline. For example, if a company that flies long-range international routes hires a large number of *ab initio* pilots, it may make sense for the company to use them as Cruise Relief Pilots until they can gain the experience necessary to fly as First Officer. Alternatively, if the First Officers assigned to the international operation are inexperienced in that theater, a more experienced pilot must be partnered with the inexperienced pilot if they occupy the control seats together during cruise. To be viable, an augmentation system must also fit into a country's culture. If a country's culture demands a strong authority figure such as a Captain as Pilot-in-Command during all phases of flight, it would not be acceptable to other crewmembers to have a First Officer as acting Pilot-in-Command when the Captain is off the flight deck. Thus, the demographics and culture of the airline and its pilots have influenced the implementation of the airline's dual-augmentation system.

Finally, an augmentation system must consider the type of routes the carrier flies. Some routes are more challenging than others. Factors that affect the risk on any given route are:

- **Remoteness** – routes that are far from viable alternates, polar routes, the Russia/China route, etc.
- **Duration** – longer routes that stretch the time a Captain must be available for command should a contingency arise
- **Departure time** – fatigue and alertness are more difficult to manage during certain departure times
- **Terrain** – landforms that require extra vigilance such as the New Delhi or Brazil routes, special decompression escape routes, etc.

- **Communications difficulties** – problems encountered in maintaining ATC communications
- **ETOPS considerations** – those routes that push the time limits of ETOPS certification
- **Special procedures** – special qualification airports and routes
- **Fatigue** – inadequate recovery time during or after trips or the cumulative affects of all risk factors

Routes that are technically more challenging to fly because they encompass one or more of the risk factors listed above require more experience and a better-rested crew on the flight deck. The more risk factors a particular route has, the greater the risk for that route. In other words, the risk factors are cumulative.

### **Challenges to United Airlines' Augmentation System**

In implementing its augmentation system, United Airlines faces challenges that few other airlines must address. Due to the geographic location of the United States with respect to the rest of the world, United's route structure requires many 13 hour to 16 hour segments to reach its destination cities. This requires more dual-augmented segments than single augmented or basic crew segments. In fact, United Airlines ranked second in the world behind Singapore Airlines in daily dual-augmented hours flown in August 1998. To complicate matters, United Airlines has five 744 domiciles located throughout the country. Also, the United Airlines' Training Center is not collocated with any of the 744 domiciles.

In addition to the geographical challenges listed above, the augmentation system in place at United Airlines presents the most difficulties for pilot proficiency when compared to other airlines. As currently implemented, United's one Captain and three First Officer dual-augmentation system hinders pilot proficiency and safety by allowing:

- Relief only lines of flying assigned to fully qualified crewmembers
- A culture that does not equitably distribute takeoffs or landings
- Captains that normally fly 50% of all takeoffs and landings
- Three First Officers that must share 50% of all takeoffs and landings
- Scheduling practices that inadequately distribute practice opportunities
- Recency requirements that do not realistically address pilot proficiency (4 activities in 180 days)
- A reserve system that ignores pilot proficiency
- Seniority as an overriding factor in scheduling and manning decisions

During the past two years, many changes have been made to the United Airlines augmentation system that have fixed some of the problems associated with pilot proficiency. **However, from our visits to the other airlines, it is obvious that more changes are necessary and an augmentation system that better promotes pilot proficiency and flight safety is needed.**

### **Recommendation 1: Recommended Augmentation System for United Airlines**

As was indicated earlier, the best augmentation system should maximize the essential augmentation system components, fit into the demographics and culture of the airline, and

minimize the risks for any route flown. Instead of recommending a dual-augmentation system that is airplane specific, our findings suggest that United Airlines base their augmentation system on all of the above three criteria. *We believe that when a crisis situation arises, United Airlines should have a highly experienced and proficient crew available to handle the situation.* Our augmentation system recommendation recognizes the fact that the 777 will soon dual-augment and will add ETOPS considerations to the risk factors.

As a result of the criteria listed previously, we recommend a dual-augmentation system that requires the pilot who relieves the Captain to have greater experience and training than is currently required. To satisfy this requirement, we recommend another Captain or a Senior First Officer (SFO) to relieve the Captain as Pilot-in-Command. The augmenting crew would then consist of an additional Captain and First Officer crew or a SFO and First Officer crew when dual-augmentation is required. This arrangement satisfies the first two criteria for maximizing augmentation system components and matching the demographics and culture of the United Airlines pilot population.

The only criterion remaining is to minimize the risk for each route flown. The decision on whether to add a Captain/First Officer or a SFO/First Officer augmenting crew is based on minimizing the risk on a particular route. Therefore, the routes with the most risk would warrant a two Captain and two First Officer crew, while routes with less risk would warrant a Captain, SFO, and two First Officer crew.

The 744 international route structure at United Airlines consists primarily of dual-augmented, out-and-back segments with very little domestic or tag-on flights. Additionally, these routes are typically flown over remote areas or require special procedures. For the routes that are considered high-risk as discussed on the previous page, we recommend using an additional Captain as a relief PIC. Therefore, on a dual-augmented flight on a high-risk route, an additional Captain and First Officer would be added. Similarly, on a single-augmented flight on a high-risk route, an additional Captain would be added.

On routes where the risk is not as great, a SFO would be used as a relief PIC. For example, on routes that are shorter, fly over areas where suitable alternates are closer, don't use the aircraft's full ETOPS capabilities, etc., a SFO rather than a Captain would be required as a relief PIC. Therefore, on single-augmented flights on routes with lower risk, a SFO would be added and on dual-augmented flights on these low-risk routes, a SFO and a First Officer would be added.

Augmenting with an additional Captain or SFO would improve the overall safety of United Airlines dual and single-augmented operations by ensuring there is an experienced PIC on the flight deck at all times. The advantages this additional experience provides are discussed below.

The experience an additional Captain provides:

- A higher level of total experience on the flight deck
- An appropriate level of command, during all phases of flight, to handle all contingencies
- A PIC, who is rested, to make critical decisions
- A better quality rest for the crew who is on their rest break

One of the other major advantages of dual-augmenting with an additional Captain/First Officer crew is the opportunity for control seat practice is maximized for four-pilot crews. Using the Northwest Airlines style of augmenting, all pilots on the crew get to practice either PF or PNF skills each segment. This is very important for United Airlines since most 744 segments flown are dual-augmented, out-and-back pairings.

Under the present augmentation system and scheduling practices, the opportunity for First

Officers to practice PF and PNF skills is poor. For example, if four pilots each have a monthly line of flying containing three LAX-SYD trips, typically the Captain would get three takeoffs and landings. In addition, the front seat First Officer would get two takeoffs and landings and one relief First Officer would get one takeoff and landing. The remaining relief First Officer would not accomplish any takeoff or landing requirements. Even if takeoff and landings were shared, the opportunity for practice would be less. This is because the Captain must be in the left seat for all takeoffs and landings.

A SFO, although not as experienced as a Captain, can make up for an experience shortage in the cockpit. During a dual-augmented flight, it is currently possible for both Relief Pilots flying together to have little or no aircraft or international experience since there is no experience verification for the relief pilots (i.e. whether pilots have less than 75 hours flight time on the 744). If this crew is required to fly over a special qualification route, their lack of experience could lead to problems. While they could wake the Captain if needed, his judgment could be impaired due to fatigue or drowsiness. A SFO, however, would remedy this situation since the Captain and SFO would not fly together, the SFO would relieve the Captain for rest. Besides ensuring experience for the crew, a SFO could provide mentoring and training for an inexperienced First Officer. The SFO would also provide a clearer delineation of who is the acting Pilot-in-Command when the Captain is off the flight deck.

We believe that augmenting with a Captain/First Officer or a SFO/First Officer crew best satisfies all of the criteria for pilot proficiency and safety. Tests need to be conducted to determine all of the particularities involved with this system. We believe it should be acceptable to all involved parties.

## Other Individual Recommendations

The following individual recommendations can be used to improve our augmented operations. These recommendations are grouped according to our model of pilot proficiency.

### Scheduling

**Recommendation 2: United develop a scheduling protocol for building monthly lines of flying that more equitably distributes landing opportunities among all pilots.** During the visits to the seven airlines, the team noted scheduling techniques were used to improve a pilots proficiency. All of the airlines distributed landing opportunities better than United. United Airlines distributes landing opportunities in a limited way using side letter 99-03 of the contract. Scheduling could provide a better distribution of the landing opportunities for First Officers. For example, a monthly line containing three front seat trips and one relief trip could be changed to two trips of each type. The extra front seat trip could be added to a relief line that is made up of pure relief pairings. When some senior First Officers average 18 landings in six months and junior First Officers average two, a better distribution of landings should be possible. Most of the carriers visited ensure that their pilots fly in a control seat during takeoff or landing at least once during a pairing.

United Airlines should choose an improved scheduling technique for their augmented aircraft. Some solutions observed at other airlines include:

- **Monthly lines of flying should have an even distribution of takeoff and landing opportunities.** Proficiency is highest when the lines of flying has the most even mix of basic crew, augmented, and tag-on pairings along with both front seat and relief pairings. Scheduling should spread the basic crew and tag-on trips into as many lines of flying as possible. This avoids complacency by keeping pilots current in all aspects of that fleet's type of flying and destinations. Pilots know who will make the landing and can plan their pre-trip rest.
- **Eliminate the seat designation on First Officer lines of flying.** Make all First Officer pairings the same and have the Captain decide during the briefing who makes a takeoff or landing based on need. This option does not allow pilots to pre-plan their rest without taking an inordinate amount of effort but still puts the least current pilot in the seat.
- **Augmented-crew aircraft should have the landing pilot designated in the pairing.** By designating the landing pilot in the pairing, a mixture of lines with front seat and relief duties could be made. This will allow scheduling to equally distribute landing opportunities to the pilots. It will allow a pilot to prepare properly for the expected rest break for that segment. Compared to a system that allows pilots to decide who will accomplish the landing during the flight planning stage, it avoids conflict among the crew by removing the decision. Pilots will also know what type of pairing is available for trip trading purposes.

**Recommendation 3: United develop a scheduling protocol for reserve pilots that provides more landing opportunities.** Reserve under the present system does not give a pilot adequate tools to maintain proficiency. Our reserve system should be revised to improve proficiency. Some solutions seen at the airlines visited include:

- Seed each reserve and secondary line under the current system with a PF or PNF event.

- Adopt the Qantas style of reserve distribution: double the number of reserves and alternate their assignment every other month between reserve duty and line holder
- Give a small number of reserve days to all pilots.

**Recommendation 4: United Airlines schedule pilots completing OE with some specified period of time for regular line flying before allowing a reserve assignment.** This will allow the pilot time to consolidate his training and achieving a higher starting level of proficiency before possibly spending long periods of time on reserve without flying.

**Recommendation 5: United Airlines establish a program to increase the experience of pilots following their OE by giving OE lines of flying to 744 pilots that are new to international operations or flying their first glass aircraft.** Pilots that are new to international operations and/or glass aircraft are given a lot of new information in a short amount of time. Sometimes it is hard to retain all of the information presented during qualification training and OE. By recognizing that this problem exists, UAL should provide a program that addresses these issues and includes several months of line flying with a regular schedule will better consolidate training and facilitate acquiring a higher starting level of proficiency.

**Recommendation 6: United Airlines should not allow more than one pilot on a dual-augmented crew to have less than four months experience on that aircraft.** All the carriers visited check experience minimums of all four pilots or require sufficient training and total experience to not need a crew pairing restriction. United Airlines is the only airline visited that checks for a minimum experience level of only their *front seat* pilots. When possible, crews should also be paired to have high experience pilots fly with low experience pilots.

## Currency

Currency is defined as pilots achieving their mandatory currency and recency requirements. We found that airlines have both currency and recency requirements that are defined by their regulator and company. Maintaining currency and recency requirements does not by itself make a pilot proficient, but it does require a pilot to practice his skills periodically to help maintain proficiency. It is obvious that if all flying on a fleet is dual-augmented, the number of landing opportunities is less than if there is more single-augmented or non-augmented flying. Our visits indicate that it is important to spread the landing opportunities among all the pilots in the fleet to maintain the proficiency of the entire group. All the airlines visited except United Airlines share the takeoffs and landings among all the pilots. This is accomplished by spreading takeoff and landing opportunities among the pilots in their monthly schedules, building patterns with multiple non-augmented segments, or simply having the crew decide who needs the takeoff and landing for proficiency or currency reasons.

While simply maintaining currency in the aircraft does not make one proficient, it does mean the pilot should have a chance to practice flying skills in the aircraft on a regular basis, which increases proficiency. At United Airlines, there are cultural differences at the different domiciles and on the different airplanes regarding the willingness of the Captain and the First Officer holding the flying line to let the First Officer holding the “relief” line fly their segment.

**Recommendation 7: Assign more responsibility to the individual pilot to maintain his own currency and provide him a means to accomplish this.** All the airlines visited assign the responsibility of maintaining currency and recency to the pilot. This is a joint responsibility with the company and they are proactive in ensuring pilot's compliance with trying to maintain currency. A pilot cannot be responsible to maintain his currency unless you give him some tools to accomplish it. Unlike United Airlines, all airlines visited gave the pilot the means to maintain their currency. When seniority permits, every First Officer should attempt to bid trips that would allow him to practice flying skills and maintain currency. Some additional techniques seen at the airlines visited that help pilots maintain currency are:

- **Consider allowing the autoland to count for currency.** Several airlines, including Northwest, allow the autoland to count as a landing for both the Captain and First Officer in order to update landing currency. Others counted an autoland for Captain currency requirements only.
- **With Captain concurrence, allow pilots to fly an ID if loss of currency will occur later in the ID.** Several airlines allow this practice with Captain concurrence. If a pilot needs one event to keep from becoming non-current and has several legs to accomplish this event, it only makes sense that he be allowed to fly the ID versus attending currency training.

**Recommendation 8: Establish a system to allow a pilot on an augmented crew to accomplish a currency event (the takeoff, landing or PNF) based on need.** All Captains and First Officers should understand that safety and professionalism must be placed above seniority or personal sentiment. It is everybody's responsibility to ensure that every cockpit crewmember is current and competent on the 744. United Airlines and ALPA should develop and implement a policy that empowers the Captain to take a pro-active interest in maintaining the proficiency and takeoff and landing currency of First Officers. While protecting seniority, establish a culture of sharing and cooperation to maintain proficiency by sharing PF and PNF duties. This policy should permit the crew to decide which pilot will accomplish the takeoff, landing, or PNF duties for each segment. The policy should emphasize dividing the PF and PNF duties among all pilots to maximize recency and proficiency and not just satisfy seniority. The policy should outline what is expected of the Captains and First Officers and final authority should remain with the Captain. When a First Officer will not be the PF during an ID, the Captain should consider letting him operate as the PNF for the Captain's segment. The UAL landing policy should be the same for all fleets and between all domiciles. This policy, with guidelines, should be supported by all domiciles and printed in the FOM to prevent conflict between crewmembers.

**Recommendation 9: UAL, ALPA, and the FAA complete additional research regarding our expanded definition of proficiency to develop currency and recency requirements that realistically reflect pilot proficiency.** We concluded in an earlier report that the measure of a pilot's proficiency should be a combination of both PF and PNF duties. The committee believes there is a direct relationship between how often PF and PNF duties are performed, and the proficiency of the pilot in performing these duties. With this in mind, the team recommended in December 1999, that the measure of currency be redefined by the FAA to more closely reflect proficiency in both PF and PNF duties. This definition of currency should be extended to include the FAA 90-day currency requirement. Under the expanded measure of currency, the three takeoff and landing requirement could be changed, for example, to a certain quantity of PF or PNF duties within 90 days. UAL adopted a recency requirement that reflected



this philosophy, requiring all First Officers to have a minimum of four takeoffs and landings in the control seat as either PF or PNF every 180 days. Based on our on-site visits to the seven airlines, the team feels this recency requirement is too low and an augmentation system that allows the First Officer's more practice opportunities needs to be implemented.

## Experience

**Recommendation 10: UAL and ALPA determine the level of experience desired on the flight deck for long-range operations and ensure that pilots who are awarded these bids have that experience.** United Airlines needs to have a minimum level of experience on the flight deck at any given time. This experience level should be defined by longevity with UAL, longevity as a Captain, total flight hours, total flight hours on type and total hours flying long-range operations. For the past 12 years, along with its most senior Captains, UAL has had First Officers on the 744 that were very senior as well. These First Officers stayed on the airplane for a long time and were very experienced, many even having previous UAL Captain experience. Most recently, however, the First Officer bids on the 744 have begun to go junior to the point that in April 2000, there were four unfilled bids in San Francisco. Pilots with less than a year with UAL are able to bid First Officer on the 744. The overall experience level in the cockpit has also declined. UAL needs to take immediate steps to ensure the overall experience level on the flight deck does not fall below the minimum safe level. Under the current augmentation system at UAL, First Officer assignments on augmented fleets should require seniority plus a minimum level of UAL experience. When augmented flying has a First Officer acting as acting Pilot-in-Command, his duties should not just be assigned based on seniority but also on experience. Some bidding restrictions should be in place for fleets requiring dual-augmented operations. With an extra Captain or Senior First Officer, adequate experience for the acting Pilot-in-Command is assured.

## Assigned Crew Duties

### Command

**Recommendation 11: United Airlines establish a minimum experience level for the pilot who relieves the Pilot-In-Command.** Airlines studied recognize the particular demands of international operations and the need for a minimum level of experience in the cockpit at all times, particularly for the crewmember designated to be in command. They satisfy this experiential need in two basic ways. Three of the seven carriers visited and approximately 43% of the original 31 airlines surveyed used a Captain. Four of the seven visited specified a minimum level of experience and specialized command training for a First Officer who relieves the Captain. If this requirement is met by assigning a second Captain, a policy must be in place to resolve any conflict. If this is to be met with an experienced First Officer, the minimum experience level must be published, suitable command training must be given, and schedules must be bid or distributed in such a way to accomplish this end. (See Lufthansa SFO and British Airways APIC).

### Crew Management

**Recommendation 12: United Airlines should change the assigned duties for its augmented aircraft to reflect a two-pilot cockpit.** All airlines visited operated their dual-augmented aircraft as a two-person operation when assigning crew duties. None of the carriers studied had specified duties for the augmenting crewmembers when all were on the flight deck.

United Airlines does not operate the 744 strictly as a two-person aircraft; they operate the 744 as a two, three, or four-person aircraft depending on the number of pilots required for a particular flight. Augmenting crewmembers have specific published duties during ground and flight operations that are normally accomplished by the basic crew on non-augmented flights. Some pilots have become dependent on these additional crewmembers and may forget to accomplish some of their assigned duties when augmenting pilots are not used. It makes sense to fly a two-pilot airplane as it was designed. For all flights, the aircrew duties should be divided between the two pilots. If augmenting crewmembers are on board and in the cockpit, they should be allowed to assist the crew with routine tasks on request, but primarily function as safety observers during critical phases of flight.

**Recommendation 13: United Airlines review its current policy addressing the management and use of additional pilots on the flight deck for augmented crews.**

Some airlines did not require augmenting crewmembers to be on the flight deck with the operating crew, but common practice was they were present in the cockpit. Captains at one airline specifically desired to preserve the two-person operation of the cockpit and did not want four crewmembers present, considering it a distraction. Most airlines routinely use three pilots in the cockpit during takeoff and landing. United Airlines should review its policy on how many crewmembers are required in the cockpit during takeoff and landing and how three or four pilots effectively work together. Additionally, UAL should review its policy on how the augmenting crewmembers are used during irregular and emergency procedures and what safety call-outs they should be allowed to make.

## **Training**

### **Qualification**

**Recommendation 14: Qualification training be customized based upon the experience of the pilot.** Although training at all airlines was similar in type, duration, and quality, a few noteworthy exceptions should be highlighted. Three airlines vary the length of the transition course based upon previous aircraft flown or individual pilot experience. For example, KLM has 26 different syllabus combinations based on a pilot's previous aircraft flown or seat position. Thus, the basic course is modified to provide more or less training based upon the needs of the pilot. As an example, the syllabus for a pilot who is transitioning to the 744 from the 777 could be significantly shorter than the syllabus for a pilot who is transitioning to the 744 from the 727. Not only are the 727 aircraft systems significantly different from the 744, but the type of flying differs as well. A pilot who has never flown the international operation or on a glass aircraft will probably require more training than a pilot who has had previous glass and international experience to reach the same level of proficiency. Forcing all pilots to fit into the same training "mold" is inefficient and costly both from a monetary and an operational viewpoint. Individualized training is more relevant, more effective, and better received.

**Recommendation 15: All pilots should be trained to accomplish critical cruise emergencies as solo maneuvers.** Long-range flying, by its very nature, has unique challenges that do not arise as often as during the short-range, domestic type operation. One item that occurs more frequently is that a pilot is not in his seat due to physiological or physical needs. To cope with this, two airlines visited train all pilots to accomplish specified critical maneuvers by themselves. Certain procedures are of a more critical nature and may require an immediate response from a crewmember to help ensure a successful outcome. Waiting for the other pilot to

return to his seat prior to taking action may degrade the successful completion of the procedure. Examples of critical cruise maneuvers trained by these airlines include the emergency descent and the initial steps of the cruise engine failure. Other maneuvers may be appropriate.

## **Operational Experience**

**Recommendation 16: Customize the OE to the needs and experience of the individual.** OE functions as a validation of qualification training and introduces the pilot to the aircraft, theaters of operation, long-duration flight, and the risks associated with international operations. International flight also exposes a pilot to communication difficulties and procedures that are vastly different from domestic operations. As such, the importance of this training should not be taken lightly. Of the seven airlines visited, four accomplish a minimum of eight segments to help the pilot learn these concepts. Some airlines also require more segments for initial Captains. All airlines except one require route qualifications. During the OE, some of these airlines also require pilots to fly to all theaters where the aircraft operates. Specifying a number of segments and not flight time satisfies these requirements, since a time based requirement is not as appropriate for long-range aircraft. **To customize the OE for pilots not previously international qualified, United Airlines should consider requiring more segments, flights to all theaters of operation for Captains, and OE lines following training.** Since more segments will be flown and the quality of the training will improve during the OE, United Airlines should petition the FAA to consider reducing or eliminating the number of landings a Captain must make following OE. This can be accomplished by allowing the landings accomplished during the OE to count towards the 10 landings required, or reducing the number of landings required following OE. The 10-landing requirement should be required for initial Captains or Captains who have demonstrated difficulties in landings while in training or during the OE.

## **Continuing Qualification**

**Recommendation 17: UAL maintain a crew complement for Continuing Qualification that accurately reflects their dual-augmentation system.** Many airlines visited require a true crew complement for Continuing Qualification simulator sessions. This provides more realistic training and checking for the crewmembers since it represents the actual line operation. With its current dual-augmentation scheme of one Captain and three First Officers, United Airlines currently has either a Captain/First Officer or a two First Officer crew for Continuing Qualification simulator sessions. If UAL should adopt a two-Captain/two-First Officer dual-augmentation system, they should require a Captain/First Officer crew for all Continuing Qualification simulator sessions. Similarly a Captain, Senior First Officer, and two First Officer crew for dual-augmented operations should require either a Captain/First Officer, SFO/First Officer, or Captain/SFO crew complement.

**Recommendation 18: United use the Northwest Airlines Flight Management Computer (FMST) type training system to teach Qualification and Continuing Qualification lessons.** Northwest Airlines has a new state of the art classroom that uses a FMST type training system. It uses an integrated, computer-based instruction method for teaching all FMS operations. Both scripted briefings and CBT type lessons can be developed and taught. Computer stations using this system also have free-play capability with fixed-based flight

simulation. The use of the FMST system will increase pilot proficiency by allowing pilots to train and practice anytime and anywhere. Computer stations should be located in all domiciles to permit pilots to practice FMS procedures or accomplish training. Make the training lessons and system simulation capabilities available to all pilots via the Internet.

## **Other Training Recommendations**

**Recommendation 19: Implement an additional CLR training program addressing the management and use of additional pilots on the flight deck for augmented crews.** Augmented crew operations can be difficult to manage and present unique challenges. During an emergency situation, a successful outcome may rely on how well three or four pilots effectively work together. Current CLR training does not adequately address the issues or train crews in augmented operations. Initial CLR and Continuing Qualification CLR training should present scenarios requiring three or four pilots to work together.

**Recommendation 20: ALPA enhance the Professional Standards Program to assist pilots with proficiency problems.** Properly assessing pilot performance is difficult when pilots are formally evaluated only once every year. A professional pilot cadre desires a mechanism to assure and enhance the proficiency of all its members. Several airlines visited have a formal system whereby a pilot may identify another pilot who is lacking proficiency so they can receive additional training. The current emphasis in Professional Standards involves interactive relationships between crewmembers rather than pilot proficiency. *ALPA should provide a better, formalized feedback system whereby a pilot can identify another pilot with proficiency problems so that pilot can receive help in a non-punitive manner.*

**Recommendation 21: United Airlines establish a training program to help increase the knowledge and experience of pilots following their OE.** Qantas Airlines has a program to help their Cruise Relief Pilots learn international, company, and flying procedures after their OE. Experience suggests that it is difficult for some pilots to absorb everything they are taught during Qualification, International, and OE training. Additional practice and exposure to items covered in this training in the months following OE would help reinforce these concepts and improve a pilot's experience and proficiency in these areas. This type of program would be very beneficial to a pilot who is new to international operations.

**Recommendation 22: United and ALPA establish a policy that precludes a pilot who has failed an upgrade course for command issues from holding a flying position that allows him to relieve the Captain as acting Pilot-in-Command.** Many airlines visited consider a pilot's "suitability for command" a requirement to upgrade to Captain or to fly as the acting Pilot-in-Command of an augmented flight when the Captain is off the flight deck. Pilots receive a type rating on augmented aircraft so they can act as the Pilot-in-Command in the Captain's absence. When a pilot is no longer suitable to command, he should not be able to relieve the Captain or make decisions on his behalf.

## **Practice**

The skills retained by the pilot is proportionate to the ability to practice pilot skills on a frequent basis. This practice can be performed in the actual operation of an aircraft, simulator, or other advanced training device. Exclusive practice in the simulator is not advisable, however, because pilot skills and proficiency will degrade over time if a pilot cannot practice in the airplane.

Our experience also indicates that pilots need practice in more areas than just takeoff and landings. The ability to practice both PF and PNF skills in the terminal area allows pilots the ability to practice standard operating procedures, terminal area operations, CDU programming, and develop situational awareness. On the highly automated aircraft, a pilot also needs to practice using autoflight to maintain proficiency in both PF and PNF duties.

**Recommendation 23: United Airlines adopt an augmentation system that maximizes practice of pilot skills in a control seat.** All the airlines visited allowed their pilots to practice their PF or PNF skills either every segment or as a minimum, every third segment. The Northwest Airlines scheme of using two Captain/First Officer crews and splitting the flight in two equal halves allows each pilot to practice their PF or PNF skills during a takeoff or landing on every segment. A Northwest Airlines' pilot flies few segments each month because 85% of their flights are dual-augmented. They have compensated for this by using an augmentation scheme that allows their pilots to maximize practice when they fly. Contrast this with Air France which flies mostly single-augmented flights. Their practice of having different First Officers in the seat for takeoff and landing allows all three pilots to practice their PF/PNF duties on each segment. If most of the flying for a particular fleet is dual-augmented, the two Captain and two First Officer system is best for four fully qualified pilots. If most of the flying is single-augmented or basic crew, then the same amount of practice could be achieved with the Air France system.

**Recommendation 24: United Airlines track takeoffs and landings separately so that different pilots can accomplish the takeoff, landing or PNF duties on a segment and receive proper credit.** More pilots can practice currency event skills on a single flight if tracking of the events is recorded separately. This currently cannot be done since ACARS only logs landings. This policy will require United to change their ACARS tracking software to allow recording the pilot acting as PF and PNF for each takeoff and landing.

**Recommendation 25: United Airlines develop a program to make more simulator time available on a voluntary basis for pilots on long-range aircraft.** Several airlines provide this type of program and use volunteer instructors or no instructor. To reduce maintenance costs, they may also operate without the motion. It is anticipated the less experienced pilots would predominantly use this extra simulator time during their first year to gain experience and proficiency.

**Recommendation 26: United Airlines maintain an adequate amount of non-augmented flying on dual-augmented aircraft, distributed evenly among lines of flying.** Similar to the need to practice PF and PNF skills to stay proficient, pilots also need to practice two-pilot crew procedures when operating an airplane that is designed to be flown with two pilots. Having important items performed by augmenting crewmembers can allow some pilots to become complacent and lose skills and familiarity of flying with a basic crew. Operating non-augmented segments permits pilots to maintain this familiarity and proficiency. Having non-augmented flying in as many lines as possible will increase the practice opportunities for many pilots.

## Physiological

### Rest Policy

Recognizing that a rested and effective crew is important to a safe operation, carriers studied employed different rest schemes to assure the best function and efficiency of the flight crew. Two specific rest schemes were used that take a different approach to rest than is currently in use at United Airlines (see KLM report and Air France report). Another practice was particularly flexible in meeting individual rest needs (see Qantas report).

**Recommendation 27: United Airlines provide in-flight rest break guidelines based on scientific data that addresses optimum rest patterns.** Items to consider are time of departure, crew body time (home domicile time), length of segment, length of pattern, and time required to re-orient oneself into the operation and get prepared for arrival (see KLM report). Research should address the perceived effectiveness of multiple shorter rest breaks, a different length or pattern of rest for the operating crew than for the relief crew, and an optimum time for the landing crew to return to the flight deck to ensure they are alert and ready for terminal area operations.

### **Fatigue Training**

**Recommendation 28: United Airlines provide fatigue training for all new hire pilots and refresher training on fatigue as part of the international training course and during Continuing Qualification.** Fatigue is an unavoidable part of long-range flying. While all the carriers studied had contractual or regulatory limitations for crew scheduling to limit fatigue, only Northwest and American Airlines reported any formal training in understanding fatigue, how to recognize it, and how to mitigate its effects. That training consisted primarily of a video based on NASA fatigue studies. Recommended training should cover information that will allow pilots to recognize, understand and mitigate fatigue.

**Recommendation 29: United Airlines distribute to all pilots information currently available on how best to prepare for, mitigate, and recover from fatigue.** The information should focus on rest, diet, and exercise during operations across many time zones. It is suggested that this information be in either pocket card format or FOM page format for ease of use when in-flight.

### **Alertness of Crew**

**Recommendation 30: United Airlines petition the FAA to permit in-seat cockpit napping.** NASA studies have documented that long periods of time on duty in a pilot seat are fatiguing, particularly at night and/or after successive days of disruption to the normal sleep pattern. Many airlines have implemented the results of these studies in the form of controlled rest, or cockpit napping, often called the “NASA nap”, to reduce the effects of fatigue and enhance the alertness of a crewmember. In the U.S., the FAA has permitted in-seat napping only for three-pilot aircraft, irrespective of workload, time of day, or other operational or fatigue factors. Foreign airlines that allow napping stated this policy increases the alertness of their crews and thus the safety of their operation. Their findings are consistent with the napping study conducted by NASA. If napping is allowed, pilots should be trained to accomplish selected critical cruise emergencies by themselves (see Recommendation 15).

**Recommendation 31: United Airlines adopt a formal policy that allows reading of operational, professional, or general periodical literature.** A study has determined that reading increased the alertness of those who are engaged in routine or non-demanding tasks or those subject to fatigue (See KLM). One airline that has a formal policy that allows reading in the cockpit reports its crews stay more alert as a result.

**Recommendation 32 : United adopt a policy requiring a minimum of ten minutes between each crewmember changeover during augmented crew changes.** Northwest Airlines uses this policy effectively. It appears that this improves and assures alertness of the first new crewmember before the next crewmember changes. It also ensures that two separate crew change briefings take place for improved safety and information transfer.

### **Other Noteworthy Programs**

During our on-site visits of other airlines, we observed some noteworthy programs in use at these airlines that while not related to the study, should be adopted at United Airlines.

#### **Publications in aircraft**

Several airlines we visited do not require their pilots to maintain their own personal copies of Jeppesen charts. The charts are available on the airplane. This reduces the costs associated with all the pilots continually updating the charts. While this may not work for all UAL operations, it certainly makes sense in the long-range fleets. A similar recommendation would require pilots to maintain Jeppesen charts for normal destinations and required alternates, while the remainder of the publications would be kept on the airplane. Extra copies of charts were made available in operations if crewmembers wanted to have their own copies to study.

#### **Fly away packets**

One airline designed flyaway packets that could be used by their pilots flying specific routes. These flyaway packets were available in operations. The packets contain all the route-specific information in one place.

### **Other Augmentation Schemes Investigated**

Since several airlines in our study flew with Cruise Relief Pilots, we examined several Relief Pilot and dual-qualified pilot augmentation schemes. We used data from telephone interviews, surveys, and the on-site visits. Based upon our findings, we examined three possible augmentation schemes that use relief pilots, dual-qualified pilots, or a combination of the two. The first scheme uses Cruise Relief Pilots. The next two schemes use pilots who are qualified to fly two different airplanes, or a dual-qualified pilot. In the first dual-qualified pilot scheme, the pilot is fully qualified and flies in a control seat on both aircraft. In the second scheme, the pilot is fully qualified and flies in a control seat on a narrow-body aircraft, but operates as a CRP on an augmented aircraft. Each of these augmentation schemes is discussed below.

## **Cruise Relief Pilots**

Both of the airlines we visited that have CRPs use the position as an entry-level position to provide experience for their newly hired pilots. These newly hired pilots include *ab initio* pilots. The CRP position allows inexperienced pilots an opportunity to learn company rules and flight procedures, gain experience, and further develop their flying skills. As these airlines have structured the CRP position, it does not fit well into the United Airlines system. United Airlines does not hire *ab initio* pilots. Instead, our average new-hire pilot has approximately 3500 hours flight time. Additionally, our findings show that CRP focus and motivation starts to degrade after one to two years in the position. Pilots interviewed stated that the CRP position was fine for *ab initio* pilots, but other pilots with extensive flight experience did not like the position and felt a lack of motivation after a few months. Motivation also degraded for permanent CRPs.

Although we studied dual-augmentation systems with Cruise-only Relief Pilots, it was not in this group's charter to make a recommendation regarding their use. These systems do not fit United Airline's or ALPA's philosophies as discussed in the "Letter of Understanding" for the study. Both UAL and ALPA are fundamentally opposed to creating a non-flying position. As described in the section discussing essential augmentation system components, new-hire CRPs lower the experience level in the cockpit and they have no opportunities to practice their pilot skills. Piloting skills degrade over time if they are not used regularly. In the recent past, some UAL pilots developed long-term proficiency problems when they remained in a non-flying position for an extended period of time. Programs had to be developed to provide these pilots with additional training and practice before they could upgrade. While using Cruise-only Relief Pilots at UAL would increase the number of landings available for the remaining pilots on the aircraft, it would be offset by the negative impact on the proficiency of the Cruise-only Relief Pilots who do not get to practice flying skills. Over time they would lose their flying skills and extra training may be required to rebuild their skills so they could safely function as a First Officer. While the time spent as a relief pilot could be limited contractually, when hiring slows and stagnation occurs, they could become stuck in the position for years. Like previous flight engineers at United Airlines, our findings indicate that pilots who sit in a control seat and fly the aircraft, even if just for one flight, have better focus and motivation than those who do not fly. As a result, a dual-augmentation system that allows all pilots to maintain their hand-flying skills is safer as long as pilots receive the proper training and opportunities to practice their pilot flying and pilot not flying skills.

## **Dual-Qualified Pilots**

During the initial information gathering stage, 31 airlines were surveyed to determine the different crew augmentation systems in use. None of the airlines surveyed had pilots that were completely dual-qualified and flew as Captain or First Officer on two different types of airplanes. Only one airline, South African Airways, used a dual-qualified pilot who is fully qualified on one aircraft, but also flies as a CRP on an augmented aircraft. At South African Airways, a pilot can fly as a Captain or First Officer on the 737, A320, A300 (the primary aircraft), and as a CRP on the 744 (the secondary aircraft). The pilots must complete qualification training on both airplanes. The pilot then maintains full qualification on the primary aircraft and maintains only cruise qualification on the secondary aircraft. Pilots normally fly one trip a month as CRP. Air Canada has tested and is trying to implement a similar system using an A320 First Officer who is also fully qualified to fly the A340. When flying the A340, the pilot would only function as a CRP. Our team investigated these systems to determine if they would work at United Airlines.

## Background Information

- **South African Airways**



South African Airways is the only airline that currently uses a pilot who is fully qualified and flies one aircraft, but acts as a CRP on another aircraft. They have used it successfully for 12 years as a way to increase the handling opportunities for the Captains and First Officers on the 744 and still maintain the flying skills of the CRPs. They have not experienced any problems with this system. They have approximately 120 dual-qualified pilots. The pilots fly as a Captain or First Officer on either a 737, A320, or A300 (as the primary aircraft) and as a CRP on the 744 (the secondary aircraft). A pilot's initial assignment at South African Airways is as a CRP. This lasts approximately 2 years. The pilot then upgrades to a narrow body First Officer and must consolidate training on the narrow body airplane for at least 6 months before becoming dual-qualified. The pilot then completes a full qualification training course (including landing training) on the 744. A few items are excluded from the training course because he will not be required to do them in his role as a CRP. The dual-qualified pilot maintains full instrument qualifications on the primary airplane and attends only a one-day recurrent training for the secondary airplane that covers CRP duties only. As a CRP, the pilot operates the radios, CDU, MCP, and FANS. He would also be expected to assist and perform several cruise abnormal, irregular, and emergency procedures.

- **Air Canada**

Air Canada has tested a dual-qualified system using the A320 and A340 aircraft. The pilots fly as a First Officer on the A320 (the primary aircraft) and as a CRP on the A340 (the secondary aircraft). The pilots must complete qualification training on both airplanes. Several of their management pilots reported that their test was successful and both union and company officials liked the system. Air Canada and its pilot union are currently in negotiations to adopt this system.

- **Common Type Ratings**

The Air Canada augmentation system relies on the common type rating between the A320 and A340. Both aircraft have identical cockpit instrumentation, position of instruments, and procedures. Except for the 757/767, none of the Boeing long-range aircraft share a common type rating. Boeing aircraft are designed to take advantage of the state of the art enhancements at the time they are built. These enhancements not only include instrumentation, but also crew complement, autoflight systems, human factors engineering, etc. Pilots who train on these aircraft comment on their similarity on the one hand, but then curse the slight differences on the other hand. The many differences are noted not only in the instrumentation, as stated earlier, but also the resulting performance and procedures. For example, the 744 autoflight system does not protect from stall or overspeed in any autoflight mode like the 737. Also, when TOGA is pushed with the autothrottles disengaged on the 737, they will not engage like the 744 on a go-around. These examples highlight the differences that could cause some major problems for dual-qualified pilots on Boeing aircraft when they have to react in an emergency. These problems do not exist for the A320/340 or the B757/767 aircraft.

- **Military Flying**

Many UAL pilots have been dual-qualified, flying one aircraft for United Airlines and another for the Guard or Reserve. The amount of training and studying required for a pilot to remain current on two aircraft is significant. The amount of training increases dramatically if the two aircraft are fundamentally different, especially in how they are flown or how their systems are designed. All members of this team have been dual-qualified while serving as a UAL pilot. Team members attest to procedural errors they observed dual-qualified pilots make during flight because of differences between the two airplanes. These procedural errors

could lead to an unsafe condition.

### Conclusions

- **A pilot who is fully qualified and flies in a control seat on two different aircraft**

Dual-qualification for pilots flying the A320/340 or B757/767 aircraft is appropriate. Not only is there a common type rating, but also procedures, instrumentation, autoflight philosophy, and much more are very similar. Differences between the 744, 747, 777, and 767 and differences between Airbus and Boeing aircraft make this a less desirable arrangement. These planes do not share common features, procedures, and performance. Safety is decreased since the instrumentation and procedures vary just enough to cause confusion or disorientation.

- **A pilot who is fully qualified and flies one aircraft, but acts as a CRP on another aircraft**

The only data available to this team from other airlines that would validate this system for United Airlines is the South African Airlines example. Their operation is small compared to what an equivalent operation would be at United Airlines. Further study and testing would be required to see if this system is feasible for United Airlines and can be used with our previous dual-augmentation recommendations. To get the most benefit from this type of augmentation system at United Airlines, the pilot should have previous international experience. This requirement would help ensure the experience level of the crew remains high enough that having a minimally qualified pilot on the flight deck does not hinder the effectiveness of the crew. The primary aircraft flown by the pilot should not be another augmented aircraft because this would further reduce currency and practice opportunities and not allow maximization of flying proficiency.

## EPILOGUE

Many of the current practices of United Airline's augmentation system do not optimize the safety and proficiency of long-range, dual-augmented operations. It is not our purpose to determine why these practices were developed or to judge each of them. Our purpose was to study worldwide augmentation systems and provide recommendations on how UAL can improve its dual-augmentation system. This report contains many techniques that other airlines use to increase safety and pilot proficiency. Based on our findings, we have included recommendations to improve United Airline's dual-augmentation system. Most of these recommendations will also increase the safety and proficiency of single-augmented operations.

During the course of this study, our team noted the following important observation: *most airlines had a consistent philosophy regarding international long-range operations*. This philosophy is applied consistently to all fleets with international operations. This is not the case at United Airlines. At UAL, there are not only inconsistent operations between fleets, but also at different domiciles within the same fleet. For example, the 777 fleet at IAD routinely allows the Relief First Officer and the First Officer assigned the control seat to exchange duties. They will also give a segment to the Relief First Officer if he needs the landing for currency. These practices rarely, if ever, occur in the 744 fleet and may not be practiced at other 777 domiciles. Although we have recommended the practice of sharing landings or PNF duties based on our airline visits, it has already been used at UAL on a limited basis. Our purpose is not to determine why inconsistent philosophies exist, but to offer both UAL and UAL-ALPA a chance to use our information to develop a consistent philosophy.

United Airlines must reexamine its philosophy on flight operations. The following question needs to be answered; "Is United Airlines a domestic airline flying international routes, or is United Airlines an international airline flying domestic routes?" Over the past 15 years, UAL has changed from the former to the latter. However, not all of the flight operations and training policies have kept up with this change. For example, the current FOM is written as a domestic FOM with an international supplement even though most of our fleets fly international routes. The 737 and 744 Captain OE requirements are basically the same. Are the demands and type of flying so similar that the requirements should be identical? When both Captains complete OE, do they have the same level of safety and proficiency to operate in their respective theaters? Whatever the answers, the point remains the same; the international and domestic operations are different and each provides different risks and challenges. UAL has to determine an overall flight operations philosophy for international and domestic operations that more realistically reflects this diversity and modify their policies accordingly.

This is an opportunity for UAL and UAL-ALPA to step back from the political aspects of these issues and approach them from a philosophical standpoint. Both groups are committed to make our augmented international flying the safest environment possible. Both groups expended considerable manpower and expense to allow this committee to find solutions. Now that this

study is complete and we have delivered our findings and recommendations, the next step is the most important. Our recommendation to the Steering Committee is to use the information contained in this report to:

1. Define the UAL philosophy for how international long-range operations will be conducted in terms of safety and pilot proficiency.
2. Use this philosophy and the information in our report to define both a dual and single augmentation system that realistically address both safety and pilot proficiency.
3. Publish this philosophy and ensure that it is applied consistently throughout all international fleets and across all domiciles.

Respectfully submitted,

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David McKenney  
Team Leader

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Lenny Robichaux

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Ken Prusak

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Wally Tweden



## Glossary of Terms

***ab initio*** – A pilot with minimum qualifications who has attended a formal flight training program that either is operated by or has an employment agreement with a commercial carrier. This pilot usually has little or no additional experience and usually less than 300 hours flight time. Latin: “from the beginning”.

**Acting Pilot-in-Command** – The pilot who is in charge while the PIC is absent from the flight deck. Must call the Command Captain/ Senior Captain/PIC during an emergency procedure and various other situations. Exercises command in the absence of the PIC.

**Advanced Qualification Program (AQP)** – An advanced FAA-approved training program encompassing all aspects of commercial flight training. Lessons are taught integrating systems, procedures, maneuvers, and CRM, in a LOFT environment.

**Augmented Crew** – A flight crew that is comprised of more than the minimum or basic crew to provide relief for rest.

**Base** – Airport where pilots begin and end their assignments; same as a domicile.

**City Pairs** – The departure airport and arrival airport cities for a flight, usually by accepted three-letter identifier, i.e. a flight from Washington Dulles to Charles DeGaulle would have city pairs of IAD-CDG.

**CRM** – Cockpit Resource Management: a program for management and decision making in the cockpit. The same as CLR: Command, Leadership, and Resource management.

**Command Captain** – The Captain or Pilot-in-Command that is in charge of all facets of the flight at all times regardless of presence on the flight deck.

**Cruise Relief Copilot (CRC)** – A pilot that occupies a flying seat only during the cruise portion of flight. Does not fly during critical phases of flight. May not be fully qualified and current.

**Cruise Relief Pilot (CRP)** – A pilot that occupies a flying seat only during the cruise portion of flight. Does not fly during critical phases of flight. May not be fully qualified and current.

**Currency** – Experience required by government regulatory agencies that define minimum take-off and landing experience requirements for maintaining qualification.

**Domicile** – An airport where an airline stations crews to originate a trip or pairing. A hub with aircrew basing.

**Dual-Augmented Crew** – Using four crewmembers on an aircraft that is certificated to be operated by only two pilots.

**Dual-Qualified** – A pilot qualified to fly in more than one aircraft type concurrently.

**Ex-Patriot** – A citizen of one country working for a company in another country, i.e., an American pilot working for a Korean carrier.

**First Officer** – Second-in-Command (right seat) of the aircraft. Fully qualified and current for all phases of flight.

**Flying Pilot** – The pilot in a front seat of the aircraft responsible for inputs into the controls; PF.

**Hub** – An airport where an airline conducts a large number of flight operations, where flights to and from many other cities go in and out of the airport like the center hub of a spoked wheel. May or may not be a pilot base or domicile.

**ID** – A sequence of flights starting and ending at the pilot's domicile. Also, pattern or pairing.

**International Relief Pilot (IRP)** – A Flight Engineer who is also trained to occupy a flying seat only during the cruise portion of flight. Does not fly during critical phases of flight. Not fully qualified or current as a Captain or First Officer.

**Landing currency** – Intended to imply both takeoff and landing currency.

**Leg** – One flight from takeoff to landing; a segment or sector.

**LOE** – Line Oriented Evaluation: an event conducted during Advanced Qualification Program (AQP) training to check progress or proficiency of a crew. Conducted as a LOFT scenario.

**LOFT – Line Oriented Flight Training:** simulator training designed to be typical of actual line operations conducted with a complete crew and with an open-ended progression to completion.

**Pairing** - A sequence of flights starting and ending at the pilot's domicile. Also, pattern or ID.

**Pattern** - A sequence of flights starting and ending at the pilot's domicile. Also, pairing or ID.

**Pilot-in-Command (PIC)** – The pilot responsible for all facets of the flight irrespective of his presence on flight deck. See Command Captain.

**PF** – Pilot Flying: pilot actually manipulating the controls of an aircraft.

**PNF** – Pilot Not Flying: pilot in a control seat in an aircraft in support of the PF, but not actually manipulating the controls.

**Qualification Training** – Initial ground and simulator training given a crew on a new aircraft under the auspices of the Advanced Qualification Program (AQP); transition training.

**Proficiency** – A thorough competence derived from training and practice.

**Qualified and Current** – Fully rated and certified for that seat position and maintaining required currency and recency.

**Relief Captain** – The Captain who is in charge while occupying the left seat. Must call the Command Captain/ Senior Captain/ PIC during an emergency procedure and various other situations.

**Relief Only** – A cockpit crewmember not expected to be at the controls during a critical phase of flight, i.e., takeoff, and landing.

**Rest Breaks** – A scheduled period of time away from the flight controls and free of all cockpit duties, designed for fatigue mitigation. Also, Rest Period.

**Rostering** – Aircrew flight assignments normally generated by the crew scheduling office.

**Second-in-Command** – Exercises command in the absence of the PIC.

**Sector** - One flight from takeoff to landing; a segment or leg.

**Segment** – One flight from takeoff to landing; a segment or sector.

**Senior Captain** – That captain with the longer tenure or some other measure of higher status as designated by the company.

**Senior First Officer (SFO)** – An experienced and specially trained First Officer designated to relieve the captain as relief PIC during the Captain's absence from the flight deck for rest. Is a specified crew position and not related to tenure with the company.

**SPOT** – Special Purpose Operational Training: training on aircraft critical maneuvers or items of fleet emphasis given under the AQP syllabus.

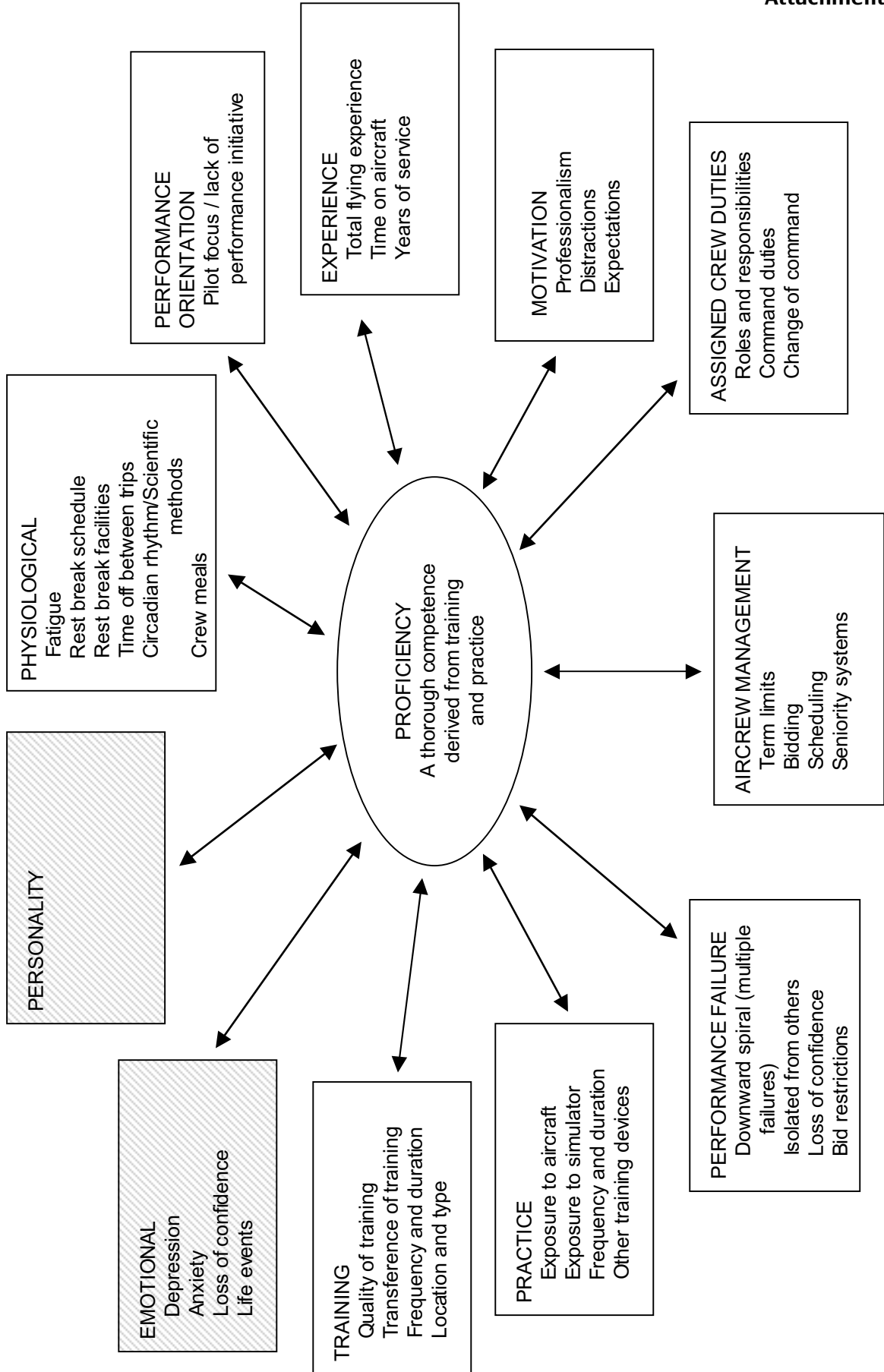
**Tag-on Flight** – Flight segments flown without augmentation in a local region between two augmented flights during a single pattern.

**Trip** – A flight or sequence of flights scheduled for a pilot grouped together into a single assignment from his domicile. Usually ends when the pilot returns to the originating base or domicile. See pattern, pairing, or ID.

**Type Rating** – A qualification issued by a regulatory agency authorizing a pilot to act as PIC on an aircraft or group of aircraft specified.



# PROFILE OF PROFICIENCY\*



\*This model addresses proficiency of all pilots in an augmented crew. Shaded boxes reflect factors that will not be investigated in the current study.

## Airline Augmentation Systems

Airline	Code	Augment System	Unique Factors and Comments
Aerolineas Argentinas	AR		
Air Canada	AC	1+2+1	CRP is entry level.
Air France	AF	1+3	Capt selects flying F/O for currency.
Air New Zealand	NZ	1+1+2	S/Os are low time, entry level positions.
Alitalia	AZ	1+3	F/Os share Indgs to mntn currency.
American Airlines	AA	1+3	Capt assigns landgs for currency.
Asiana Airlines	OZ		
British Airways	BA	2+2	Midpoint PIC chnge. Capts altn trips.
Canadian Airlines Intl.	CP	1+3	F/Os resp to mntn crncy. All ex-Capt.
Cathay Pacific	CX	1+2+1	
China Airlines	CI	2+2	
China Eastern Airlines	MU	2+2	
Delta Air Lines	DL	2+2	Sr Capt assigns all lngs, for currency.
EVA Air	BR	1+2+1/2+1+1	If 2 Capts, Sr(always PIC) can give Jr legs.
FedEx	FX	2+2	If Capt needs currency, swap PIC.
Iberia	IB	2+2	
KLM	KL	1+2+1	CRP is entry level position.
Korean Air	KE	2+2	Mid-point seat and PIC swap.
Lufthansa	LH	1+3	Senior FO (adv posn) relieves Capt.
Malaysia Airlines	MH	2+2	Capt altn PIC each leg.
Northwest Airlines	NW	2+2	Mid-point PIC change.
Philippine Airlines	PR		
Qantas Airways	QF	1+1+2	S/O is entry level position.
Saudi Arabian Airlines	SV	2+2	Midpoint PIC change. Swap legs.
Singapore Airlines	SQ	2+2	Capt altn legs. F/Os decide own legs.
South African Airways	SA	1+1+2	CRPs are entry level. Can be dual qual.
Swissair	SR	1+3/2+2	Flexible staffing. Sked can assign FO Indgs.
Thai	TG	1+2+1/2+1+1	CRP is entry level position.
United Airlines	UA	1+3	
VASP	VP	2+2	Capt assigns Indgs for currency.
Virgin Atlantic	VS	1+2+1	CRP is entry level, limited to 2 years.

**UAL CREW DOUBLE AUGMENTATION STUDY  
QUESTIONNAIRE  
For  
United Airlines**

Name \_\_\_\_\_

Title \_\_\_\_\_

Phone \_\_\_\_\_

FAX \_\_\_\_\_

Email Address \_\_\_\_\_

**Information for Follow-up Phone Interview**

Date Requested \_\_\_\_\_  
(Nov 15 — 19<sup>th</sup>)

Time Requested \_\_\_\_\_  
(UTC)

Name of Contact \_\_\_\_\_  
(If different from above)

Phone Number \_\_\_\_\_

- These questions are designed to obtain preliminary information about the double augmentation system(s) used at your airline. We define **Double Augmented Crew** as the required use of four or more crewmembers on an aircraft that is certificated to be flown with only two pilots. Please respond to all of the questions with respect to all four or more crewmembers.
- These questions are being asked as part of an on-going study at United Airlines that focuses on augmentation systems and their relationship to flight safety.
- Your participation is voluntary.
- Please contact us if you have any questions while completing this questionnaire at:  
Phone: 303-780-3758, FAX: 303-780-3720, email: [crewaugteam@ual.com](mailto:crewaugteam@ual.com).

\* \* \* \* \*

1. What are the titles of each crew position in your double augmented crews?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

2. Which crewmembers maintain landing currency in the left seat?

3. Which crewmembers maintain landing currency in the right seat?

4. Does **Pilot-in-command** normally change during an augmented flight / on a multi-leg trip? (**Pilot-in-command** is defined as the final authority and ultimate decision-maker and is responsible for the overall safe conduct of the flight).

\_\_\_\_\_ **YES**                      \_\_\_\_\_ **NO**

4a. If **YES**, which pilot has initial command?

4b. If **YES**, which pilot assumes command?

4c. If **YES**, when does command change?

5. During a typical flight, when is each crewmember at the flight controls?

6. For each crew position listed in question 1, what is the average number of years each crewmember has with your company? Is your response based on data or your best guess?

1. \_\_\_\_\_ Based on data

2. \_\_\_\_\_ Best guess estimate

3. \_\_\_\_\_

4. \_\_\_\_\_

6a. If any of the employees in these positions are temporary or contract please explain?

6b. If any of these crew positions have term limits associated with them please explain?

7. How does your airline pay your pilots? (check one below)

- pay based on seniority.
- pay based on the type of airplane flown.
- other, please describe.

8. For each crewmember position identified in question 1, how frequently is flight proficiency training given each year?

- |          |                                      |                                       |                                    |                                      |
|----------|--------------------------------------|---------------------------------------|------------------------------------|--------------------------------------|
|          |                                      |                                       |                                    | (describe below)                     |
| 1. _____ | <input type="checkbox"/> Once a year | <input type="checkbox"/> Twice a year | <input type="checkbox"/> Quarterly | <input type="checkbox"/> Other _____ |
| 2. _____ | <input type="checkbox"/> Once a year | <input type="checkbox"/> Twice a year | <input type="checkbox"/> Quarterly | <input type="checkbox"/> Other _____ |
| 3. _____ | <input type="checkbox"/> Once a year | <input type="checkbox"/> Twice a year | <input type="checkbox"/> Quarterly | <input type="checkbox"/> Other _____ |
| 4. _____ | <input type="checkbox"/> Once a year | <input type="checkbox"/> Twice a year | <input type="checkbox"/> Quarterly | <input type="checkbox"/> Other _____ |

9. What types of training events are given for each crew position?  
(e.g., annual proficiency checks, aircraft trainers, simulator landing currency, etc.)

- 1.
- 2.
- 3.
- 4.

10. How many days is each of the above training events?

11. Does your company require its pilots to obtain any currency or proficiency training outside of the company in addition to the company provided currency and proficiency training?

\_\_\_\_\_ **YES**      \_\_\_\_\_ **NO**

If **YES**, briefly describe.

12. Does your company have a *formal* program(s) to distribute landings among the qualified crewmembers?

\_\_\_\_\_ **YES**      \_\_\_\_\_ **NO**

If **YES**, briefly describe.

13. Does your company *formally* apply circadian rhythm principles when scheduling augmented trips?

\_\_\_\_\_ **YES**      \_\_\_\_\_ **NO**

If **YES**, briefly explain.

14. Does your company have a program(s) to provide assistance for pilots who have proficiency or training problems?

\_\_\_\_\_ **YES**      \_\_\_\_\_ **NO**

If **YES**, briefly describe the program(s).

15. How does your company use the aircraft and/or simulator to maintain the currency and proficiency of its augmented crewmembers?

16. Excluding simulators and aircraft trainers, what other training devices does your company use to maintain proficiency of its double augmented crewmembers? (e.g., computer based training, home study programs, videos, table top trainers, etc.)

- |  |  |                                 |
|--|--|---------------------------------|
| <input type="checkbox"/> Computer based systems training | <input type="checkbox"/> Table top flight trainers | <input type="checkbox"/> Videos |
| <input type="checkbox"/> Home study programs             | <input type="checkbox"/> FMC trainers              | <input type="checkbox"/> Other  |
|  | <input type="checkbox"/> Fixed base trainers       | (describe below)                |

17. Has your airline made any substantial changes to the way in which it manages its augmented crewmembers?

\_\_\_\_\_ **YES**      \_\_\_\_\_ **NO**

17a. If **YES**, what were those changes and why were the changes made?

17b. What changes are you planning or would you like to make in the future?

~ ~ **Thank you for answering these questions.** ~ ~



**INTERIM REPORT TO SURVEY PARTICIPANTS  
CREW AUGMENTATION STUDY TEAM  
UNITED AIRLINES  
January 27, 2000**

1. A joint United Airlines (UAL) and Airline Pilots Association (ALPA) committee is conducting a study of aircrew double augmentation concepts to determine changes that have the potential of improving the operational experience and proficiency of crewmembers. The scope of the study includes all double augmentation systems used on long-range aircraft. The relative costs of the different systems were not examined in this study.
2. The team defined the scope of the study to include those airlines using long-haul aircraft having a two-person flight deck staffed with at least two additional flight deck crewmembers in regular scheduled commercial cargo or passenger service. The Crew Augmentation Study Team identified 59 long-range international carriers for possible inclusion in the study based on flight data from the August 1998 OAG database. The team further refined this list to 31 carriers by selecting those airlines having at least one daily segment over 12 hard hours that required four crewmembers. Airplanes used by the 31 carriers that double augment include the B-747-400, B-777, A-340, and MD-11.
3. These 31 carriers were contacted using both telephone and written surveys. The surveys included questions on their long-range augmentation systems, training issues, pilot proficiency issues and scheduling techniques. Twenty-nine of the 31 carriers cooperated with the study. We use the term "worldwide" to refer to these carriers. Only the carriers who participated in the survey will be recipients of this interim report.
4. The B-747-400 (-400) augmentation system at United Airlines was studied in greater depth than the other carriers. The Study examined the recent changes made at United Airlines for the -400 program. These changes are described in Attachment A. To help facilitate understanding of United's system, the following key components are listed: The -400 is currently the only aircraft with dual augmentation. It is primarily used on long-range Pacific routes with very few short segments. United uses a single captain/ three fully qualified first officer (1+3) dual augmentation system. All schedules are bid monthly and awarded by seniority. All crewmembers can trip trade with unassigned flying trips. The first officer (F/O) lines of flying were segregated between flying position and relief position. The captain was not expected to manage the parity of F/O landing currency. Landing currency was routinely maintained in the simulator by many of the relief F/Os. The crew scheduling desk assumed responsibility for maintaining landing currency.
5. The initial phase of the study is complete. Interim findings and recommendations, which may be useful to your operation, are summarized below. We will be visiting a small number of carriers in the next few months to gather additional information

## **FINDING: CURRENCY DOES NOT EQUATE TO PROFICIENCY**

During the progress of the study, the committee realized the factors that affect pilot proficiency are very complex, and that simply maintaining landing currency\* on an airplane does not necessarily maintain a pilot's overall proficiency. While frequency of landings does not necessarily equate to proficiency, it has historically been a convenient and easily tracked unit of measure to reflect proficiency and is used industry-wide.

To better understand pilot proficiency, the committee is using a "Profile of Proficiency" model (See Attachment B) showing that many things could actually affect a pilot's proficiency. We conclude that the proficiency of a pilot should be defined not only by how well the pilot performs landings, but also include such things as standard operating procedures, pilot not flying (PNF) duties, terminal area operations and CDU programming. Performing PNF duties from the right seat enhances proficiency of first officers in the terminal area. This includes tuning the radios, building FMS approaches, practice in situational awareness and participating in decision-making processes that cannot be practiced when acting as a relief pilot.

Our experience indicates that pilot proficiency is defined not only by how well the pilot manipulates the controls, but also by how well the pilot interfaces with the automation in the role as both the pilot flying (PF) and the PNF. This is especially true in highly automated aircraft. The proficiency and experience gained in performing PNF duties on highly automated aircraft, we believe, has a direct positive correlation on a pilot's proficiency in performing PF duties.

In a significant departure from the way currency is presently defined, we conclude that the measure of a pilot's proficiency should be a combination of both PF and PNF duties. The committee believes there is a direct relationship between how often PF and PNF duties are performed and the proficiency of the pilot in performing these duties. With this in mind, the committee believes that the concept of currency should be redefined to more closely reflect proficiency in both PF and PNF duties. One of our recommendations reflects this conviction and concludes that PNF duties should be included in the recency requirements for UAL. Once UAL and ALPA have completed additional research regarding this expanded definition of proficiency, we expect additional recommendations will be made to further modify currency requirements.

## **WORLDWIDE AUGMENTATION SYSTEMS FINDINGS**

The findings described below are based on the information received from the 29 carriers that participated in the study.

- A. **A superior crew dual augmentation system was not identified.** Of the 29 worldwide long-haul carriers returning surveys, 43% use a two captain/two first officer (2+2) augmentation system while 29% use a single captain/three first officer (1+3) system. The remaining 28% of the carriers use some combination of cruise-only

\* In this report, the word *currency* is used to reflect a pilot's federally mandated requirement to accomplish three takeoff and landings in 90 days and not to reflect a pilot's proficiency.

relief pilots. Carrier selection of the type of augmentation system is not related to fleet size or region. (See Attachment C). In general, carriers developed their augmentation system based on company culture and protocols, route structure, airline ownership (state owned versus private company), country culture, union contracts or adapted a system from another carriers. Each system has strengths and weaknesses, advantages and disadvantages. Every carrier has developed programs and policies that exploit the strengths or mitigate the weaknesses of their particular augmentation system. Thus, their system works for their airline and meets their requirements for currency, proficiency and safety. Only four of the carriers are considering changes to their system.

- B. **Landing currency.** One commonality between the FARs, JARs and CARs is the currency requirement of three takeoffs and landings per pilot in a ninety-day period. All but one of the carriers contacted uses the simulator to satisfy this requirement if three takeoffs and landings are not obtained in the airplane. That carrier simply flies the non-current pilot with a check airman on a revenue flight. None of the worldwide carriers surveyed routinely used aircraft trainers to maintain or regain landing currency. Pilots flying long-range aircraft have limited landing opportunities. Maintaining landing currency in the aircraft in normal scheduled service is easier for those carriers who have a significant number of short-range segments in their long-range aircraft or who use non-landing qualified relief pilots for augmentation.
- C. **Dual qualification.** Only one carrier uses first officers from their narrow-body fleet to augment their long-range crews as cruise-only relief pilots. This carrier normally uses newly hired pilots as cruise-only relief pilots. Within two years, they upgrade to A-320 first officer, but can still volunteer to fly as A-340 cruise-only relief pilot one trip per month during seasonal shortages. An income tax incentive for international flying exists in their country. These dual-qualified pilots require extra training to include quarterly simulator training. Another airline is currently testing an A-320/A-340 dual qualification system that utilizes an A-320 First Officer as a cruise relief pilot on the A-340.
- D. **Route structure and scheduling practices affect currency problems.** Many of the carriers assign pilots their monthly schedules (lines of flying). More than ten carriers use techniques to build schedules that help pilots maintain landing currency. Some of these techniques include building schedules that combine long and short-range trips, mixing the flying between augmented and basic crew flights, mixing flying seats within trips or sectors. Some airlines give seat preference to pilots based on currency needs. Most of the carriers that use these scheduling techniques to build landing opportunities in pilot schedules do not experience many problems with lapse of currency. Those carriers that have a route structure where they fly mostly short-range segments on their long-range aircraft have few currency problems.
- E. **Formal assignment of responsibility for currency minimizes problems.** Ten carriers use formal *and* informal techniques to assign responsibility for tracking and maintaining landing currency. At least eleven carriers make the captain responsible for maintaining landing currency of his crew. At least five carriers have assigned the responsibility of maintaining landing currency to the individual flight officer. Five carriers assign their crew scheduling office to track and maintain landing currency for their pilots. One of these carriers conceded that the informal technique of having the crew manage landings was more efficient than the crew desk. When responsibility is left to the crew schedulers, more landing currency problems were encountered. (Some

of the responsibilities described above are shared between the company and the pilots and some carriers are, therefore, referred to more than once.)

Carriers that have assigned the responsibility for maintaining currency to the individual pilot or the captain rarely have currency lapses. For example, a European carrier that flies long-range flights exclusively with their long-range aircraft had only two pilots who became non-current last year. Their captains manage takeoff and landing assignments and their relief pilots are responsible for preventing currency lapses. In general, foreign carriers maintain currency better than U.S. carriers. One reason appears to be that their companies and their pilots take a more pro-active approach. Several U.S. carriers seem to have the same problems as United Airlines with currency lapses. Accountability and cultural differences appear to be major behavioral factors in maintaining landing currency.

- F. **Training issues.** Since the FARs, JARs and CARs have similar requirements, the hours of annual simulator training given to pilots by all airlines is similar in duration. Most carriers have two recurrent training events per year. This is similar to the requirement that United Airlines has recently implemented on the -400. Fourteen carriers make both of these recurrent training events checkrides. Six carriers have a PT/PC type format. Fourteen carriers use LOFTS, and many carriers thought the LOFT/PT was the single most important part of recurrent training. They felt this was because the LOFT/PT is positive, realistic training and not a checking environment. The PT was more flexible and more maneuvers-related than a PC and it is able to meet pilots' specific proficiency needs better. Two carriers are actively using FOQA data to design their recurrent training.

## **UNITED AIRLINES AUGMENTATION SYSTEM FINDINGS**

- A. **United Airlines augmentation system.** United uses a single captain/three first officer (1+3) dual augmentation system similar to those used by 29% of the world's airlines. All four pilots are fully qualified and current to operate the aircraft in all phases of flight. The dual augmentation system at United was implemented through collective bargaining.
- B. **Pilot proficiency.** A higher number of actual aircraft landings does not necessarily equate to increased overall pilot proficiency. At United Airlines we found that some fleets with a higher number of aircraft landings per pilot did not demonstrate a higher level of proficiency. A comparison of the first officer performance on the *Engine Failure on Takeoff* maneuver compiled from United First Look data clearly shows that the fleets with the highest frequencies of landings do not perform as well as the -400 fleet on the sampled maneuvers. The -400 first officers performed better at the *Engine Failure on Takeoff* maneuver than the B-777 and B-767 first officers. They also performed no worse than the -400 captains every month this past year on the *Engine Failure on Takeoff* maneuver. This may be because many -400 first officers return to the Training Center for landing classes. They practice emergency procedures and other maneuvers while obtaining their currency landings. The First Look data suggests there is far more to proficiency than simply accomplishing takeoffs and landings in line operations.
- C. **Training.** The return of the 6-month PT requirement resulted in a positive trend in the proficiency of certain graded maneuvers of sampled -400 pilots. It also contributes to the maintenance of currency. Additionally, it increases both landing and emergency procedure opportunities that a scripted or prescribed PC or LOFT scenario could not.

The PT is a non-checking event where the emphasis is on hand flying the airplane and practicing critical maneuvers that are not encountered on normal line operations. It can be flexible enough to be adapted to the specific needs of the pilot. United Airlines also instituted an Operating Experience Refresher (OER) for pilots who did not land the aircraft in the last 180 days. This has been an effective way to administer proficiency training in addition to regaining landing currency.

- D. **Landing currency.** The problem of maintaining landing currency for –400 first officers at United Airlines is reduced due to recent changes, but is still persistent. One action taken by United Airlines in response to the proficiency issue is the requirement for each –400 pilot to attend annual proficiency training (PT) in addition to the annual recurrent training and check (PC or CQP). This results in each pilot performing at least three take-offs and landings in the simulator every six months, and greatly reduces the likelihood for pilots becoming non-current. Additionally, due to worldwide economic circumstances, the –400 has temporarily been deployed in short-range, non-augmented operations, permitting additional landing opportunities for meeting landing currency requirements. Other changes described in the Scheduling section below have also contributed to first officers maintaining landing currency.
- E. **Responsibility and authority for assuring landing currency.** Crew scheduling is currently responsible for ensuring pilot currency. However, the United pilots' schedules are so dynamic that the crew scheduling tools available are not effective in preventing a pilot from becoming non-current. Some fleets provide guidance to captains stating they are “encouraged” to try to maintain the landing currency of the first officers in their crew. However, this guidance is not widely disseminated nor consistently followed.
- F. **Scheduling.** Increasing the number of flying opportunities per pilot has a direct impact on meeting currency requirements. Proper distribution of these opportunities is also important. Pro-active management solutions to currency problems include modified line building and crew scheduling intervention. United crew scheduling has become pro-active in spreading out the flying opportunities and landings for all first officers on the -400. They have mixed the first officer lines of flying by placing at least one PF trip in every first officer monthly schedule. They also spread around the temporary domestic trips generated by marketing to as many pilot monthly schedules as possible. Crew management also places a trip-trading freeze on any pilot who is within 60 days of not meeting their 180 day recency requirement. This prohibits the pilot from trading a flying (landing) trip for a personally desired relief pilot trip. The newly imposed 180 day and 90 day VMC rules have further emphasized the need to remain current. These actions have helped to significantly reduce the number of pilots with currency lapses since implementation in April 1999. The number of captains and first officers that have minimal aircraft landings has also significantly decreased since implementation of these changes.
- G. **Improved assigned duties for relief pilots.** The Flight Handbook has improved the section applying to the relief pilot duties. It gives specific guidance to the relief pilots during both normal and emergency operations. Captains are to include the relief pilot duties in their pre-departure briefing. The impact of this change has increased the focus of all pilots and not only incorporates all pilots into the flying aspect but gives direction and responsibilities to the relief pilots during critical phases of flight and during emergencies.

## **RECOMMENDATIONS TO THE CURRENT UNITED SYSTEM**

- A. Maintain the 6-month PT/PC format.
- B. Maintain the 90-day VMC and 120-day freeze requirements.
- C. Maintain the OER program.
- D. Maintain current crew-pairing limitations that restrict pilots with two checkride failures within the past 24 months from being paired together.
- E. Continue mixing flying/non-flying trips in -400 first officer lines of flying.
- F. Implement a United Airlines policy that requires every pilot on augmented crews to have a minimum number of segments every 180 days that requires the performance of either the PF or PNF duties. This requirement should include the current minimum of one takeoff and landing.
- G. United Airlines assign a person or a specific office the charge of monitoring aircrew landing currency to ensure that every pilot is given the opportunity to maintain their landing currency and meet their 180-day requirements for proficiency. A desired goal should be to have zero lapses in the 180-day recency requirements (excluding lapses for medical reasons and other reasons beyond the pilot/company control).
- H. United Airlines and ALPA should develop and implement a policy that empowers the captain to take a pro-active interest in maintaining the proficiency of first officers. This policy should permit the captain the opportunity to give a relief pilot the takeoff and landing or operate as a PNF if their 180-day recency requirements is about to expire. It also should allow captains to give one takeoff and landing to a relief pilot on trips that have three or more flight segments. The policy should outline expectations of the captains and first officers and responsibilities in being pro-active maintaining landing currency. This policy should be formalized in the Flight Operations Manual.
- I. Modify current software to track aircraft takeoffs and landings separately.
- J. Develop and implement a program to track aircraft and simulator pilot not flying (PNF) duties for captains and first officers.
- K. Develop and implement a program to track actual number of simulator takeoffs and landings performed during any simulator training event after initial training. United Airlines currently logs just three landings in the computer tracking system when more may have been accomplished during landing currency classes. These actual numbers can be used in the future to help track pilot proficiency as it relates to aircraft and simulator landings.

## **ADDENDUM**

During the progress of the study, the committee realized the factors that affect pilot proficiency are very complex. Additional research should be done to include more emphasis on pilot proficiency and how to improve it for pilots flying predominantly long-haul trips. This research may require more telephone survey work and on-site visits with similar carriers which would provide an opportunity to more deeply investigate the positives and negatives of the variant systems on pilot proficiency (not just currency) and safety. A second cadre of dedicated researchers has been added to this committee and will

continue working on this expanded definition of pilot proficiency to further investigate improvements to pilot proficiency on aircraft that use dual augmentation. The results of this group is estimated to be completed by April 2000, but will be complete by the scheduled July 2000 Crew Augmentation Status Review meeting

## **POSTSCRIPT**

Effective March 1, 2000, the FAA and United Airlines have modified the recency requirement for first officers in fleets with dual augmented crew operations. This will require first officers to have at least four airplane flight segments in a control seat from takeoff to top-of-climb and from top-of-descent to landing within the past 180 days. The first officer must be the pilot flying for takeoff and landing on one of these segments.

Two Captains  
Two F/Os

*British Airways*  
China Airlines  
China Eastern  
Delta Air Lines  
Federal Express  
Iberia  
Korean Air  
Malaysia  
*Northwest Airlines*  
Saudi Arabian  
*Singapore Airlines*  
Swiss Air \*  
VASP

Captain and  
Three F/Os

United Airlines  
*Air France*  
Alitalia  
American Airlines  
Canadian Airlines  
EVA Air  
*Lufthansa*  
Swiss Air \*

Only One  
Relief Pilot

Air Canada  
Cathay Pacific  
*KLM*  
Thai  
Virgin Atlantic

Two Relief  
Pilots

Air New Zealand  
*Qantas Airways*  
South African

\* Swiss Air seems to use both the 2 + 2 and 1 + 3 systems equally.





**CREW AUGMENTATION STUDY**

**ON-SITE INTERVIEW**

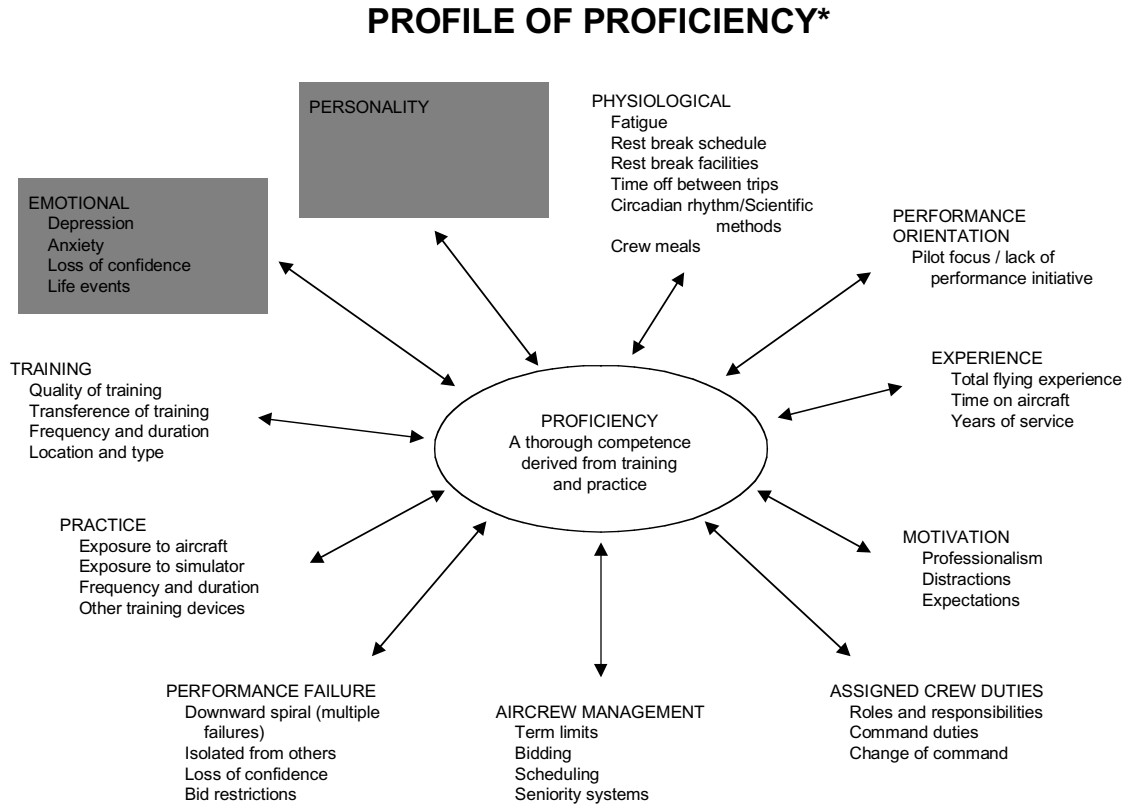
***PROFICIENCY QUESTIONS OVERVIEW***

## INTRODUCTION

- United Airlines is conducting a study of crew augmentation systems and their relationship to pilot proficiency, crew effectiveness and flight safety.
- The questions presented on the following pages are designed to help us understand your airline and its utilization of double augmented crews. So that we may be as efficient as possible in the use of your time, we would appreciate it if you and/or your staff would spend some time reviewing the attached questions in preparation for our visit. When we visit we will ask these, and possibly additional probing, questions.
- The information you provide, as well as the information we gather from other airlines, will be compiled and presented in a report prepared for United Airlines and our regulator, the Federal Aviation Administration (FAA). All personal information will be de-identified; your name will not be used in the report.
- The information you provide is crucial to the completion and documentation of this study. Your participation in providing this information is strictly voluntary, and you may decline to answer any or all questions asked. However, we need your help and strongly encourage your candid cooperation.
- If you have any questions, please feel free to contact:

**Augmentation Study Team**  
**(303) 780-3758 / fax: (303) 780-3720 or e-mail: [crewaugteam@ual.com](mailto:crewaugteam@ual.com)**

The following model was developed to better determine items that affect proficiency of aircrew members. You will notice the questions we are asking are divided into the categories shown. We are investigating all categories except Emotional and Personality, which are highlighted below.



\*This model addresses proficiency of all pilots in an augmented crew. Shaded boxes reflect factors that will not be investigated in the current study.

## **OVERALL / PROFICIENCY QUESTIONS**

The goal of this study is to evaluate various systems used to augment a two-pilot crew on long-range aircraft. We are concentrating on dual augmentation schemes in particular, with a focus on improving individual pilot proficiency and over-all crew effectiveness

Please discuss how your dual augmentation system (DAS) was selected, how it has evolved, what you have found to be its strengths and weaknesses, and how you have mitigated its weaknesses. In view of your experience, would you still choose the same DAS and implement it similarly and why?

**PHYSIOLOGICAL**

Long-range flying by its very nature disrupts the normal body schedule and places unusual physiological stresses on flight crewmembers. There have been several studies which have identified circadian patterns and scheduling systems that mitigate the impact of long-range flying on the normal physiology of the body.

Please describe how your company addresses these issues, specifically with regard to rest break practices, line building and monthly schedule guidelines, and formal training on fatigue mitigation.

How does the way you implement your dual augmentation system positively and negatively affect fatigue and pilot performance?

## PERFORMANCE ORIENTATION

We are defining *pilot focus* as the emotional, mental, and physical conduct required to allow the crewmember to perform optimally. We are interested in maintaining long-term pilot focus.

How does your airline keep the pilot group focused on maintaining the higher levels of proficiency and professionalism?

Discuss how pilot focus has been positively and negatively affected by how you implement your dual augmentation system.

## EXPERIENCE

Long-range flying presents challenges to pilots in maintaining their flying proficiency. The number of years and total flying time are two measures of a pilot's overall experience. Because of the reduced number of segments long-range pilots fly, one issue of interest is the effect a crewmembers total flying experience has on maintaining overall flying proficiency.

For each seat position on your long-rang aircraft, please comment on how you believe the experience level and tenure on the aircraft affects your crewmember's short-term and long-term flying proficiency.

For each seat position, has your airline had or are you aware of any positive or negative changes to your pilot's proficiency because they fly long-range aircraft?

## MOTIVATION

Stimulating positive motivation presents a continuing personal and organizational challenge. Pilots who are satisfied with their jobs will normally be motivated to stay proficient and maintain their flying skills.

For each seat position, discuss what you believe is the overall job satisfaction of your long-range pilots. What techniques does your company use to stimulate job satisfaction?

What changes could your company make to increase the job satisfaction of your long-range pilots?



## **ASSIGNED CREW DUTIES**

The relationship between crewmembers and the effective functioning of a crew are a result of their assigned duties.

Discuss the relationship between the pilot-in-command and other crewmembers, the roles and duties of each crewmember, and how these roles and duties are assigned or specified.

Considering command and its relationship with the role of each crewmember, please discuss how your dual augmentation system functions. Please comment specifically on any special responsibilities or special problems that crew augmentation introduce.

## AIRCREW MANAGEMENT

The way a carrier manages its pilots can affect their proficiency. Aircrew management includes how pilots are initially selected to fly a specific aircraft, how long pilots stay on an aircraft, and how long-range aircraft are augmented. Scheduling is also a very significant part in aircraft management, specifically the determination of how individual trips are constructed and how crewmembers monthly schedules are built and assigned.

Describe how your airline manages crewmembers on its long-range aircraft.

How is landing currency managed with regard to your dual augmentation system and your scheduling practices?

What management techniques do you use on your dual augmented aircraft to enhance pilot proficiency?

**PERFORMANCE FAILURE**

The pilot population of every airline demonstrates a range of performance. Each airline has established their minimum level of safety and proficiency in pilot performance. Corporate philosophy, regulations, and the culture of the airline establish this bottom line.

Describe your process for improving the proficiency of pilots who fail to achieve minimum standards.

Describe any resources your airline uses outside of your normal training programs to assist pilots? (e.g., programs which use a specialist in performance enhancement tools, programs to assist pilots with personal issues, etc.)

## PRACTICE

The exposure of a crewmember to the actual operation of an aircraft, simulator, or other advanced training device enhances skill retention. We consider *practice* to be the exercise of flying skills outside the usual training events all pilots receive, to include line flying, landing currency training, voluntary simulator use, etc.

What opportunities does your company provide for its pilots to practice their pilot skills?

Does your dual augmentation system present any special challenges to pilot skill retention and how can these problems be sufficiently overcome?

Describe how your dual augmentation system affects the number of opportunities that pilots have to practice pilot skills and how it affects their overall proficiency.

Describe any specific company requirements or techniques you have to enhance flying skills and help improve or maintain pilot proficiency (such as encouraging hand-flying, utilizing instrument procedures in VMC, etc.)

## TRAINING

The quality of training given to crewmembers has an important impact on proficiency. Assuming the instructor has done their part in the training process, this quality may be measured by examining training programs.

Describe the training provided to your dual augmented crewmembers from the time a pilot knows they are assigned to the augmented fleet until they are fully qualified. Include the content and duration of your courses, types of training aids used, and the availability of home study aids.

Describe the frequency and content of the recurrent training programs for your dual augmented crewmembers.

Do you have any specific training for each seat position based on proficiency challenges or job task?

Have you changed anything in your training program, such as frequency of visits, home study aids, etc. to enhance proficiency and why?

How does this training differ from your other fleets?

What difficulties have you experienced in transferring simulator training to a pilots proficiency flying the airplane and during aircraft irregularities?