Use of the OPP Booklet

OPP advantage:

- Know before you go!
- Provides a “How goes it” capability
- Uses time as the common denominator to balance fuel and oxygen.
- Gives flight crews the ability to “trade” one resource for another.
- Enables flight crews to make sound, accurate decisions in a timely manner.
- Review of manufactures oxygen design criteria

Plans worst case scenario:

- Assumes an engine rotor burst and debris from the engine has penetrated the pressure vessel.
- You are suddenly a single engine, unpressurized aircraft.
- Initiate emergency descent to 10,000 feet, secure the cabin and check passenger well being.
- You must get your aircraft, passengers and crew to the nearest suitable airport and land.

Questions requiring immediate answers:

- How far is it to the nearest suitable airport?
- How much fuel do we have on board?
- Is there enough fuel on board to reach the nearest airport?
- If we have to climb above 10,000 feet, do we have enough oxygen and for how long?
- What aircraft performance cruise mode should I use?
- How long will it take to land at the closest Alternate airport?
- Can I continually monitor the flight progress?

Remember the most important resource …..Fuel on board at the Equal Time Point.

The OPP booklet was originally created before the use of commercial PC computers were available. Today the booklet is still important not only as the primary reference but as a back up in the event the computer program is not available or cannot be accessed. The following is a list of the chapters and an explanation of the OPP Booklet.

Chapter 1: Preface

This chapter has a preface as well as a contents checklist. Upon receipt of the OPP the client should always check to insure nothing is missing from the OPP Booklet.

Chapter 2: ASSUMPTIONS AND CONDITIONS:

This chapter outlines the parameters and special conditions that were considered when this program was developed for the client. Each aircraft is different and this chapter will highlight the important changes or information the client should know such as:

- The international basic operating weight that was used. (Floatation gear, aircraft components and extra supplies etc).
- Approximately 2/3's of the fuel capacity was used for charting purposes.
- Long Range Cruise (LRC) was used for aircraft performance at ISA temperature. Three-dimensional plots (distance, time, and fuel required) were used to plot data.
- The fuel reserve weight that was included in the performance calculation and defined by the operator.
- Defines the information from TC or STC documentation that was used to prepare the oxygen duration charts. The oxygen flow rates, oxygen capacity, system design (single or dual) that make up these key components.

RESTRICTIONS AND NOTES:

- A set of restrictions and notes are also included outlining the importance of strict adherence when using this program.

- Changes—it is imperative that any changes affecting either the oxygen system or aircraft performance be conveyed to ADS to modify the data presented.

- Outlines Aeronautical Data Systems commitment to the OPP program.

Chapter 4: OXYGEN SECTION:

Included in this section is

- Suggested Oxygen Preflight Checklist. It is a guide, to determine how much oxygen is on board the aircraft prior to departure.
- Pressure Temperature Conversion Chart is included to help correct actual volume when temperatures are other than NTPD (nominal temperature, pressure dry, or in other words, 70 degrees Fahrenheit).
- Oxygen Inventory Check List will assist in calculating the total amount of oxygen on board prior to departure.
- Regulatory/Therapeutic Oxygen Consumption is the flight crew requirements above flight level 350 (FAR 135) or flight level 410 (FAR 91) were calculated and charted.
- Cabin Pressure Differential is a standard atmospheric chart to indicate the actual cabin altitude using cabin pressure differential versus actual aircraft altitude. It is applicable for any type aircraft. It is most useful when attempting to determine the cabin altitude in the event of a partial loss of cabin pressurization.
- Pressure/Liters Conversion Chart is used for a quick inventory if you would like to determine how many liters there are for a particular aircraft based on bottle pressure (PSI).
- Oxygen Duration Charts are supplied for the cardinal altitudes and provides duration so that the pilot can compare and then balance the fuel and oxygen.

Chapters 5 & 6: Aircraft Performance section

These chapters contain:

All engine operating charts (AEO) at the various cardinal altitudes.

One engine inoperative charts (OEI) at the various cardinal altitudes.

Both sets of charts provide 3 dimension precision plotted data (Distance, Time & Fuel).
The tabulated data contains:

- Aircraft Gross Weight.
- TAS used to calculate the LRC.
- Fuel Flow used to calculate the LRC.
- Specific Range versus the wind components used:

Blue line=	Zero Wind
Green line=	50 knot tail wind
Orange line=	50 knot head wind
Red line =	100 knot head wind

Cruise Mode:

- LRC was used rather than MSR. LRC loses 1% in range (99% of MSR) but gains 7-8% in airspeed and provides approximately a 50knot head wind protection.
- ISA standard temperature was used. Temperature does not affect range but it does affect TAS and time. If temperature increases above ISA, fuel flow and TAS increase. This means you will get to the destination faster for the same fuel that you would have expended at ISA. (more fuel yet less time in the air). The opposite applies for temperatures below ISA. Less fuel and a slower TAS means, less fuel and more time in the air. Fuel used in either of these scenarios equals the same fuel used at ISA Temperature.

How to use the OPP charts

Determine distance to go to the nearest suitable airport. (FMS or Long Range Navigation unit).

Performance Charts:

Enter the performance chart at the distance to go, trace vertically to the graphic lines with wind components, interpolate if necessary (accuracy is important) proceed horizontally left and at the fuel required column read “fuel required” for the distance to fly. Fuel required is the fuel needed to overhead the diversion airport with the desired fuel reserve as specified by the pilot/operator.

If the fuel on board is more than the “fuel required” to reach the diversion airport, the immediate emergency is over. Continue the flight at 10,000 feet and monitor the progress with the OPP aircraft performance charts.

Tabulated performance data in the left margin will enable the pilot to determine if the drag profile of the aircraft has increased. This tab data will only provide you with a “snapshot” of the aircrafts performance at that time and for the particular weight and power setting. Use the graphic chart for the” look ahead” information for “long term accuracy” and the ETE (estimated time enroute information).

Suggested pre-flight planning:

- Determine the fuel on board at the ETP.* (This information can be extracted from the flights computerized flight plan).

- Next determine ETP’s at the cardinal altitudes (10,000’,15,000’,20,000’,25,000’) .Also request the winds or wind components at those altitudes as well.

- Check the 10,000’ OPP performance chart at that altitude using the wind additive to calculate time from the ETP to the ETP diversion airport. If the fuel remaining is equal to or greater than the desired minimum fuel for that particular flight, then you have adequate fuel at 10,000 feet and the only oxygen requirement aside from any applicable FAR will be for the emergency descent. Ostensibly there is no oxygen emergency for this flight.

- If there is not enough fuel to return to the ETP diversion airport at 10,00 feet then it will be necessary to increase the range of the aircraft by flying at a higher more efficient fuel altitude. Incrementally check each altitude using the OPP performance charts starting next with the 15,000’ fuel performance chart to find the lowest altitude you can land at the diversion airport with the desired reserves for that particular flight.

- Once you have established that fuel flight level, it will be necessary to established the link, the common denominator between the fuel and the oxygen that being time (duration). Using the appropriate OPP performance chart enter the chart at the fuel amount that you calculated earlier to establish the correct fuel altitude and read horizontally to the right margin that is labeled" time". That is the time it will take you at that altitude to reach the ETP diversion airport. That time dictates the duration of oxygen required at that altitude.

Chapter 7: Oxygen duration Charts:

(Figure 1) This section contains all the oxygen duration information for your specific airplane at all the cardinal altitudes. These charts indicate altitude, aircraft specifics (registration and serial number), oxygen bottle size and number of oxygen bottles. The chart indicates whether it is for the crew or passengers, or both. Bottle pressure (*NTPD) and corresponding liters are displayed on the left side of the chart. Liters and pressure are needed to convert volume to duration. Oxygen consumption is almost always based on liters per minute (LPM) and quantity is always based in oxygen bottle pressure (psi). The charts are easy to use. Simply enter the bottle pressure (1200psi) on the left side of the chart and follow that over to the right until you reach the column that corresponds to the number of passengers (12) using the system. The time in that box is the oxygen duration (2:21) at that altitude (FL 150).

Not all oxygen contingencies are slow descents to altitude. The single line labeled "Reduction to O2 Inventory" is specifically for an emergency decompression. You will note that the value inside the boxes are liters and not time. This part of the program was developed for planning purposes for the worst case scenario, a loss of an engine followed by a decompression. These values represent the oxygen used for a descent from altitude to 10,000' and then a climb back up to the cardinal altitude that was used to create this analysis. In order to preplan to have enough oxygen on board you need to know the fuel remaining at the ETP, time it will take to travel from the desired ETP to the ETP Alternate airport and the number of passengers you intend to have on board. You will be reverse engineering this chart to some extent.

Lets use Figure 1 as our example. The flight time today to the ETP alternate is 2:30, and we have 12 passengers onboard. We would like to determine how much oxygen pressure we need to depart with so there is enough oxygen not only in cruise but enough for an emergency descent. Enter the chart at the number of passengers (12) on board and follow up the column until you arrive at a time that is equal to or greater than the time it will take to travel from the ETP to the ETP alternate (2:21). Then follow that line over to the left until you arrive at the liters column. That number is the amount of liters needed to be on board prior to departure (3167 liters) if you were not planning an emergency descent. This part of the chart is simply consumption vs. time at a specific altitude.

If you desire to plan for the worst case then you will need to add, the amount of liters of oxygen consumed for an emergency descent to the amount of liters required at altitude. Enter this chart at the number of passengers on board and go down to the single line labeled "Reduction to O2 supply" (crew is already included). Notice these values are in liters (1450 liters). Add that value which is in liters to the amount of liters you determined you needed earlier (3167 liters) to return to the ETP alternate. Once you have the total liters required (3167+ 1450= 4617 liters) simply enter the chart in the liters column and read up until you reach the number of liters equal to or greater than the amount required (4617 liters). After you have arrived at that number simply read left under the NTPD column, and that is the bottle pressure (NTPD 1800 psi) you should depart with, if you wish to include enough oxygen for an emergency descent.

* NTPD (nominal temperature pressure dry) is the industry nomenclature used for bottled oxygen pressure (psi). This represents the bottle pressure at 70 degrees farenhiet.

Some systems have what we refer to as a dual oxygen system. This means that the crew has their own independent oxygen bottles and as a result the crew will have a separate set of oxygen duration charts. It will be necessary to monitor and compare both systems and it is here where preplanning becomes essential. One scenario to bring to your attention is that while pre-planning using a dual system the crew duration should never exceed the passenger duration. In this scenario, the crew would have more oxygen duration than the passengers. Oxygen system design always allow the crew to access the passenger system through a series of one way check valves, however the passengers system can never access the crew oxygen system, therefore you would never want to intentionally depart knowing that the passengers would not have adequate oxygen supply. The oxygen duration format for the crew system is the same as the passenger system.

Chapter 7: Decompression

During high times of stress higher cognitive thinking is impaired. Included in this section is a suggested emergency decompression checklist to reference so that essential procedures are completed. Each operator can adjust this checklist to suit their particular aircraft and company requirements. This checklist is advisory only.

Chapter 8: Physiology

Past articles that have been written about high altitude physiology are enclosed. This section is a reference and an informational chapter to help the new and seasoned pilot better understand the effects of high altitude physiology. The operator should continue to add to this section as new information is discovered in this field.

Chapter 9: FAA A/C circulars

FAA A/C circulars # 25-20 and 61-107 for pilot and operators review.

Chapter 10: Client Disclaimer

This client disclaimer outlines the responsibilities of both ADS and the client pertaining to the use and understanding of this program.