

Competitive Financial Benefits Analysis for Data Link Equipage



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20 October 1997

**Organization: F065
Project: 0298012Q-NW**

MITRE

Outline

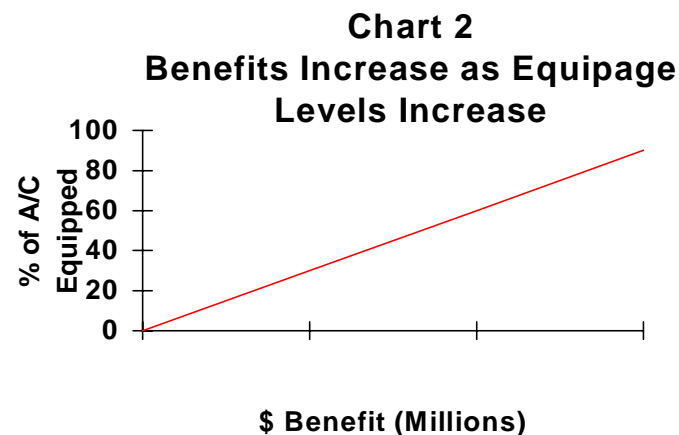
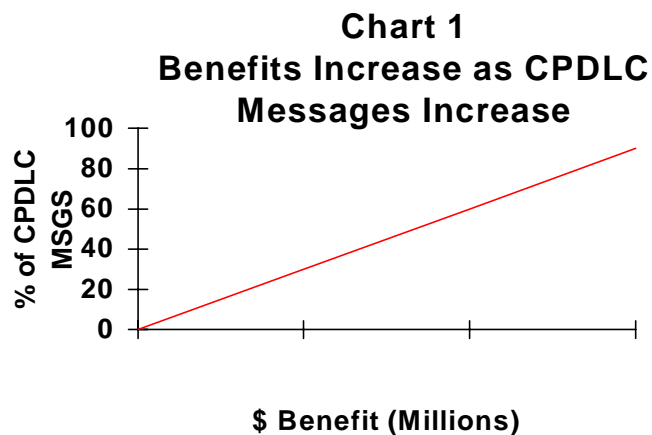
- **Background**
- **Assumptions**
- **Approach**
- **Results**
- **Conclusions**
- **Equations**

En Route Data Link Benefits

- **CPC financial benefits analysis used results of the en route data link benefit study conducted in 1994**
- **En route data link benefits study**
 - **Simulated 2 sectors in Atlanta ARTCC that routinely experienced delays due to voice frequency congestion**
 - **Arrival sector (09): Eliminated holding and improved vectoring which decreased average flight time and miles flown**
 - **Departure sector (32): Reduced miles in trail which reduced ground delays**
 - **Conducted national site survey that identified 43 en route sectors and time periods that experienced similar delays and restrictions due to voice frequency congestion**

CPC Benefit Calculation Assumptions

- Data Link benefits are a direct result of the reduction in voice frequency congestion
- Reduction in voice frequency congestion is directly proportional to the data link messages transmitted; each data link message transmitted provides the same amount of relief time on the voice channel (Chart 1)
- Benefit is directly proportional to the equipage level in the ATC airspace (Chart 2)



CPC Financial Benefits Approach

- **Approximately 30% of all controller to pilot messages in the en route data link benefits study apply to CPC (TOC/IC)**
- **Assumed results of national site survey are still valid**
- **Analyzed 7 days worth of ETMS data position reports from October 1996 along with the sector boundaries from the 1994 adaptation to determine the specified airline percentage of aircraft in the benefit sectors at the identified time periods**
- **These percentages were used to calculate the time saved in the air and on the ground due to the use of CPC**
- **Time saved results in financial benefit due to reduced operating costs**

Competitive Financial Benefits Analysis

- **CPC financial benefits are determined on a per rush period basis for each identified sector**
- **Each airline in the sector during a rush period receives some benefit based upon the percentage of the aircraft in the sector that are operated by the airline**
 - **Assumption: Each aircraft receives the same amount of benefit**
 - **Not valid for each instance but is a good characterization over an extended period of time (such as the year of the en route data link benefits study)**
 - **Airline benefit is the total of the benefits for each of its aircraft in the sector during the rush**
- **Total airline benefit per ARTCC is the sum of the benefits achieved in each sector for each rush period**

Competitive Financial Benefits Analysis (Concluded)

- **Calculated financial benefits for 2 airlines in 1 ARTCC**
 - **Financial benefits for each airline given that only it equipped for CPC**
 - **Financial benefits for each airline given that only the other equipped for CPC**
 - **Financial benefits for each airline given that both equipped for CPC**
- **Compared financial benefits for each airline in each result**
- **Expanded analysis to 3 airlines to look for financial benefit patterns**

Annual Financial Benefits Comparison for 2 Airlines at 1 ARTCC



Conclusions

- **Each airline that operates in a CPC sector receives financial benefit**
- **The airline with the largest portion of traffic in a CPC sector receives the largest portion of financial benefit**
 - **Airline with the largest portion of traffic should equip first to maximize the competitive advantage**
 - **Financial benefit increases as equipage increases**
 - **Competitive advantage decreases as other airlines equip but total per airline financial benefit increases**
- **CPC financial benefits are maximized when all equip**
 - **Approximately 48% of traffic in the benefit sectors and rush periods is operated by the 9 major airlines (AAL, COA, DAL, FDX, NWA, TWA, UAL, UPS, USA)**
- **Conclusions apply to any controller-pilot data link implementation**

CPC Competitive Benefits Analysis Equations

- $CPC_rush_benefit = CPDLC_rush_benefit * CPC_msgs\% * Equipped\% / 90\%$
- ☞ $CPC_bene(Airline, \text{airline(s) equipped}) = CPDLC_bene * CPC_msgs\% * Equipped\% / 90\% * Airline\%$
- $CPC_bene(A1, A1) = CPDLC_bene * CPC_msgs\% * A1\% / 90\% * A1\%$
- $CPC_bene(A1, A2) = CPDLC_bene * CPC_msgs\% * A2\% / 90\% * A1\%$
- $CPC_bene(A2, A1) = CPDLC_bene * CPC_msgs\% * A1\% / 90\% * A2\%$
- $CPC_bene(A2, A2) = CPDLC_bene * CPC_msgs\% * A2\% / 90\% * A2\%$
- ☞ $CPC_bene(A1, A2) = CPC_bene(A2, A1)$
- $CPC_bene(A1, A1+A2) = CPDLC_bene * CPC_msgs\% * (A1\%+A2\%) / 90\% * A1\%$
- $CPC_bene(A1, A1+A2) = CPDLC_bene * CPC_msgs\% * A1\% / 90\% * A1\% + CPDLC_bene * CPC_msgs\% * A2\% / 90\% * A1\%$
- ☞ $CPC_bene(A1, A1+A2) = CPC_bene(A1, A1) + CPC_bene(A1, A2)$
- $CPC_bene(A2, A1+A2) = CPDLC_bene * CPC_msgs\% * (A1\%+A2\%) / 90\% * A2\%$
- $CPC_bene(A2, A1+A2) = CPDLC_bene * CPC_msgs\% * A1\% / 90\% * A2\% + CPDLC_bene * CPC_msgs\% * A2\% / 90\% * A2\%$
- ☞ $CPC_bene(A2, A1+A2) = CPC_bene(A2, A2) + CPC_bene(A2, A1)$

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