The Total Economic Value

Its application to the Single European Sky – 2nd Reference Period

1. The idea of Total Economic Value.

   The Total Economic Value (TEV) is a term introduced officially into the Single European Sky by the Performance Reference Body in their "Proposed regulatory approach for a revision of the SES Performance Scheme addressing RP2 and beyond" – March 01, 2012. It is supposed to supplement the performance measurement in the Key Performance Areas. The TEV concept has not yet been developed by the PRB. It has arisen from Cost – Effectiveness Analysis methods. As such, it is intended to represent any Key Performance Area in its financial equivalents, bringing costs and effects of expenditures into one common denominator, which allows for studying variations and optimum values of the TEV during any period, including SES Reference Periods. Supplementing Key Performance Targets with the TEV analysis permits for clear and visible presentation of:

   a. Balance among various Key Performance Areas on EU level, FAB level or State level, depending on the aggregation of data used for calculation financial equivalents of the Performance Indicators;
   b. Actual financial impact on an average Aircraft Operator's costs in a given region, depending on the quality of representation of the actual AO's costs by the elements of the TEV.

   The concept of presenting Capacity KPA in the financial terms and balancing it with expenditures on reducing delays has been used already in Performance Plans for the First Reference Period, including the Polish Performance Plan. At the moment of publishing the PRB "Proposed regulatory approach…" three Performance Areas were estimated in financial terms: Cost, Capacity and Environment.

2. Candidates for the Total Economic Value.

   a. Direct cost – unit cost.

      The basic and obvious component of the Total Economic Value. It contains the cost that airspace users refund directly to ANSPs and NSAs using Unit Rates (separately ENR and TNC) and the calculation formula.

   b. Indirect costs.

      These are costs borne by airspace users as result of the "airspace environment" created by ANSPs on the base of:

      i. ICAO and EU regulations – mostly the fundamental conditions for safe air traffic: separations in space and time between aircraft;
      ii. State regulations and procedures – mostly additional criteria for separation in space and time due to airspace access limitations (e.g. danger areas and/or separation of General Air Traffic and Operational Air Traffic);
      iii. Limited resources of ANSPs themselves – mostly related to air traffic controllers number and their working time management, but also limits in systems services availability and more or less optimum solutions of flight procedures, like SID/STAR.

The elements of the "airspace environment" give the total result measured by the PRU/PRB as "cost of delays". For this purpose an equivalent of 81 Euro per one minute delay is assumed (or 83 Euro if additional fuel burn is concerned).

3. Limits of the Total Economic Value.
   Assuming that "costs of delays" appropriately represent actual losses of airspace users due to inefficient services of Air Navigation Service Providers (regardless from the nature or source of an inefficiency) the ideal situation would be to minimize ALL costs that result from providing air navigation services to airspace users: direct costs + indirect costs. Two extremes are:
   a. "Zero indirect cost" at the full direct cost of providing "no delay" and "optimum trajectory" service;
   b. "Zero direct cost" at the full cost of theoretical management of air traffic in "one own-navigation aircraft in the airspace" mode.

   Everything between those two extremes is a combination of non-zero direct costs paid by airspace users for services more optimum than "one in the airspace". In practice, the SES targets are setting limits to the sum TEV = Direct Costs + Indirect Costs. The TEV limit is narrowing in time. In the original SES wording the limits EU-wide for the end of the 1st Reference Period are:
   - Direct cost expressed as the average ENR Determined Unit Rate = 53.92 Euro (expressed in real terms, Euros 2009)
   - Indirect cost expressed as the average delay per flight = 0,5 minute

Assuming the level of air traffic in Europe in 2014 as 114,6 mln Service Units the total direct cost to the airspace users would then be 6,18 bln Euro. On the other hand, assuming the traffic level in 2014 as 10,08 mln operations, the indirect maximum cost of delay would be 413,2 mln Euro, including additional fuel burn. Therefore the target Total Economic Value defined as =Direct_cost+Indirect_cost in 2014 would be 6,6 bln Euro. In comparison, the TEV EU-wide in 2011 was 7,2 bln Euro, which gives the TEV brackets as intended decrease of the Total Economic Value of 8,3% between 2011 and 2014. Other, better normalized units of TEV that can be used are coplete cost per operation or complete cost per composite flight hour gate-to-gate.

4. Limitations and quality of the Total Economic Value. The quality of the Total Economic Value and its applicability is subject to limitations:
   a. Indirect cost to airspace users vary depending on:
      i. Actual cost of 1 minute delay of the particular airline at particular destination;
      ii. Fuel consumption as result of trajectory flown;
      iii. Other less obvious components of indirect cost, e.g. travel time, departure and arrival predictability;
      iv. Change in time of delay cost and fuel cost, that influence forecast and long-term targeting.
   b. It must be remembered that direct and indirect costs depend from each other. Therefore the Total Economic Value – in particular TEV as a function, not as a single value - shall not be expressed as the single equation TEV=Direct_cost+Indirect_cost, but as a set of equation. The remaining components of the set shall combine inter-alia:

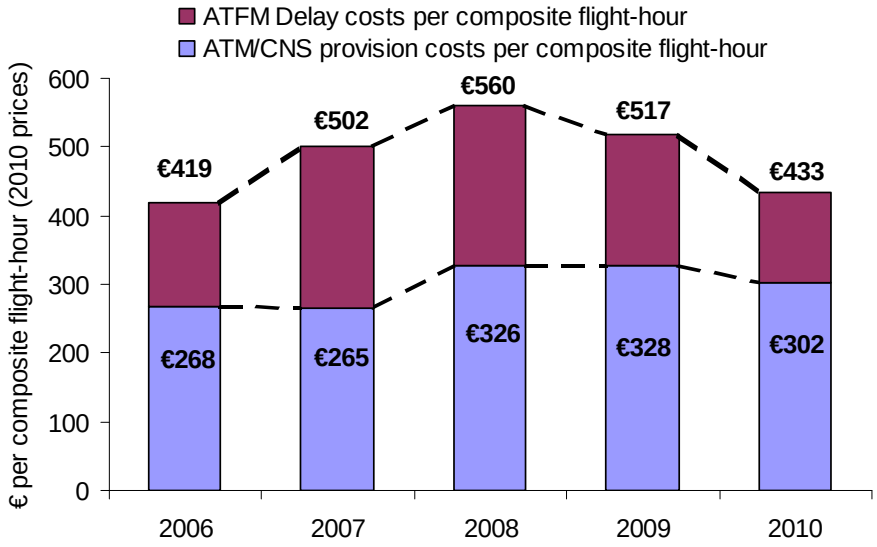
i. Indirect cost of delays (delay values) versus actual cost of operational staff who provide their service of air traffic control;
ii. Indirect cost of flight re-routing versus actual cost of TWR ATC and airport navigation equipment;
iii. Indirect cost of additional fuel burn versus indirect cost of capacity supply in the airspace (in particular TMA);
iv. Indirect cost of delays versus direct cost of ATM equipment maintenance;
v. Etc.

The above ECONOMIC dependencies can unlikely be represented in a form of equations, but rather as multi-dimensional vectors of indicators supported by rules of managing an ANSP. They are THE MOST IMPORTANT AND ESSENTIAL PART OF THE TOTAL ECONOMIC VALUE as a function and represent the actual business model of an ANSP.

c. The mature and reliable Safety Management System identifies risk areas and measures risk of accidents in the identified areas. Safety recommendations as risk mitigation tools create natural barriers to any component of the TEV "equations" set. Thus safety management procedures and actual risk values make the TEV "equation set", the ANSP business model and the targets trade-offs complete.

5. Possible analysis of the Total Economic Value.
   a. High-level analysis:
      i. Post-factum analysis and statistics of the basic equation TEV=Direct_cost+Inderect_cost. The variations inside the equations set (changes to all the components and their interdependencies are not visible);
      ii. Targeting of the Total Economic Value inside the frames that are built by the sum of cost- and delay targets.
   b. Low-level analysis:
      i. Analysis of an ANSPs business model and of the complete set of internal ANSP performance indicators.
      ii. Fragmentary analysis of the TEV IRR as result of investment impulses.
6. Proposals of practical use of the Total Economic Value in the first and second Reference Periods.

   The financial effectiveness and economic effectiveness of PANSA between 2006 and 2010 was calculated by the PRU/PRB (at the EU average of 544 Euro in 2010):



The above provision costs (direct costs to airspace users expressed in real terms '2010) are not presented in the same units as prescribed by the European Commission in the Decision of December 2010 (Determined Unit Rate in nominal terms). They have however been used for years by the PRU as benchmarking tool and have the same form as indirect costs (delay costs). Thus, both direct and indirect costs can be added and presented together as the Economic Effectiveness. This is one of possible forms of the Total Economic Value.

In the second Reference Period the Total Economic Value can be supportive to the most probable package of the Key Performance Indicators:

a) SAFETY
   - EU-wide targets on Effectiveness of safety management (maturity)
   - EU-wide targets on application of severity classification scheme
   - EU-wide targets on application of Just Culture while development and introduction of new RP2 safety indicators for monitoring purposes only
   - Risk deterioration in State-identified risk areas

ENVIRONMENT
   - Horizontal flight efficiency where EU and FAB target are based on actual trajectory and use of civil-military airspace structure with detailed on-line data is only monitored.
   - EU-wide targets on additional time in taxi-out phase and additional time in arrival sequencing and metering area (ASMA) while developing and monitoring a horizontal and vertical performance only.

b) CAPACITY
   - EU-wide target on ATFM per flight broken down by FAB
   - Monitoring total ATFM delay attributable to airport/terminal air navigation services, monitoring ANS gate delay and ATFM slot adherence

c) COST-EFFICIENCY
   - EU-wide target setting for en-route ANS and performance review and benchmarking for terminal ANS.

The extended set of Performance Indicators is both the beauty and the disaster. This set makes the stack of the total value paid by airlines more complex and more difficult to manage. That's the disaster to the model, especially considering new players: airports and military aviation. The beauty of it is that it makes the demand for revealing economic dependencies between direct and indirect costs even stronger:

- Indirect cost of delays at airports versus direct cost of airport charges;
- Indirect cost of re-routing due to military activity accepted as inevitable balance with States' defense achievements.

7. Co-operation in the Aviation Community in using the Total Economic Value.

The earlier described limitations of the Total Economic Value, like variations of additional fuel-burn costs, changes in actual cost of delay, re-routing cost etc. introduce on one hand instability to the Total Economic Value, making it less dependent on ANSPs efforts. On the other hand, if the target Total Economic Value is declared by an ANSP, it shifts part of airspace users' business instability into the ANSP declaration, thus making additional share of risk between airlines and ANSPs. This approach requires close cooperation between both parts of the air transport sector in sharing actual data – not only data on ANSPs own costs (i.e. direct cost to airlines) but also data on airlines' own costs that are caused by additional fuel burn or re-routing. All these costs, accumulated, shall then be minimized by efforts of both sides.

The second Reference Period makes the stage more interesting – depending how widely the Total Economic Value will be supposed to cover indirect costs of various types and caused by various partners. But regardless whether a wide range of direct and indirect costs will build the single balanced cost value, or they are presented separately, the crucial issue is to reveal dependencies among them and to fairly balance among actual cost-payers and actual beneficiaries, whether they are:

- Airlines,
- Air Navigation Service Providers,
- Airports,
- Regions,
- State defense.