

# Research project economic analysis—an example

As a representative example of the application of a variety of available data in support of the on-going calculation of prospective benefit/cost relationships for a specific research project, the AAR economic analysis staff suggests this item, an analysis of the first item in a phased development project included in the current five-year plan as part of the Vehicle Track Systems Program:

## Wayside/on board detectors

*Objective:* To determine the reasons for the increase in the rate of roller-bearing failure and to optimize the methods of detecting incipient bearing failure.

*Benefits:* Reductions in train delays from stops due to erroneous hot box detections and reductions in derailments caused by true bearing failures. Delays have an economic cost for unproductive time for equipment and labor (FRA estimate: \$165 per train hour). The total number of delays industry-wide is unknown; statistics from a small sample of railroads (including statistics on the performance of three types of detectors) extrapolate to a total of 145,000 delays annually, estimated up to 40% from false readings, stopping trains for an average of 25 minutes, for a total of \$4.2 million in delay costs.

Bearing-related accidents cost the industry \$56.7 million annually (4 year average, factored to include under-reporting and as-

sociated non-reportable costs).

*Assumptions:* On the basis of project manager assessment of project plans and prospects at its current (early) stage, the analysis is based on the following assumptions:

1. Improved detection device will eliminate false hot box indications.
2. Approximately 2,400 hot box detectors in the industry.
3. Improved detection device will reduce

cost for accidents caused by true bearing failures by 60%.

4. Capital cost of \$5,000 per detector (addition to cost of current device). No increase in number of detectors or operating cost.
5. Probability of research success is 70%.
6. Probability of implementation success is 90%.
7. Implementation will begin in 1989 and continue for 6 years.

## Project economic analysis

Undiscounted cash flows:  
(\$, thousands)

Year	Research Expense	Implementation Operating	Costs Capital	Industry Savings
1985	0	0	0	0
1986	58	0	0	0
1987	303	0	0	0
1988	328	0	0	0
1989	288	0	1,265	3,981
1990	238	0	1,265	7,962
1991	248	0	1,265	11,944
1992	0	0	1,265	15,926
1993	0	0	1,265	19,907
1994	0	0	1,265	23,889
1995-2000	0	0	0	23,889/yr.
<b>Totals</b>	<b>1,463</b>	<b>0</b>	<b>7,592</b>	<b>226,942</b>
<b>After-tax</b>				
<b>Present value:</b>	<b>620</b>	<b>0</b>	<b>2,608</b>	<b>57,910</b>
<b>Net present value:</b>				<b>54,682</b>