

Future Challenge in Automobile and Fuel Technologies
for a Better Environment

JCAP Overview

Nov. 2000

JCAP Promotion Department
Petroleum Energy Center (PEC)

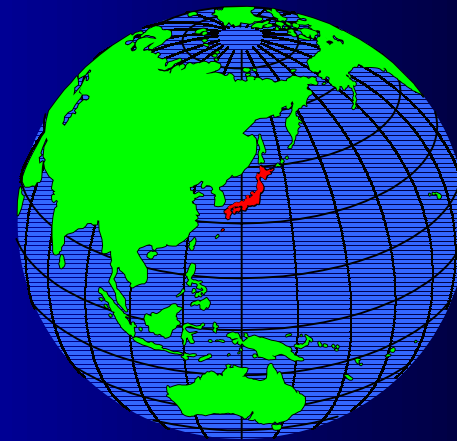
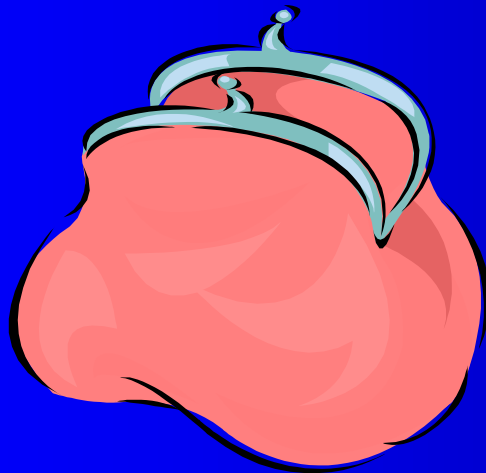
What is JCAP?

(Japan Clean Air Program)

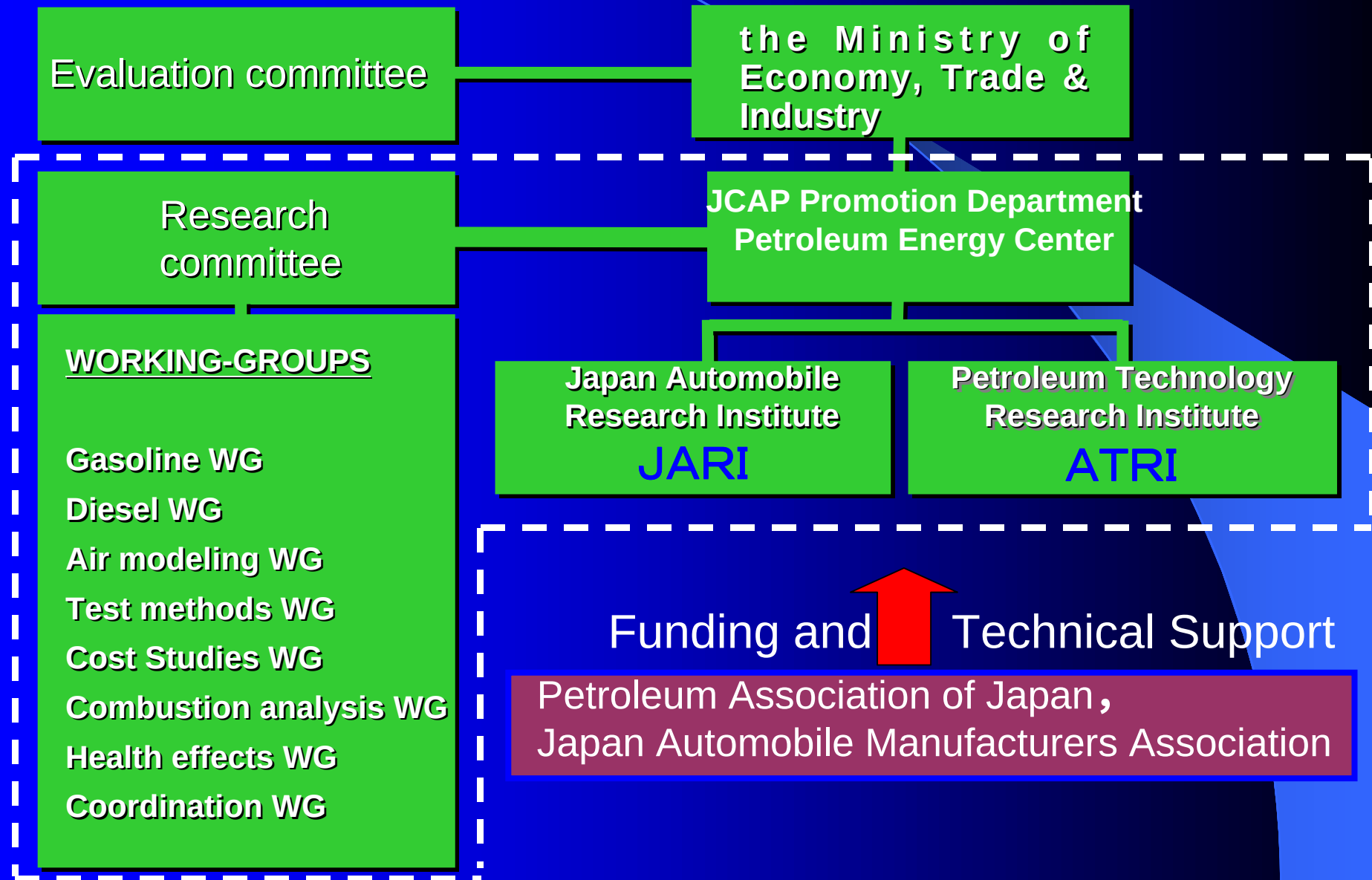
- Collaborative study by automobile industry and petroleum industry
(Subsidized by the Ministry of Economy, Trade & Industry)
- 5-year plan from 1997 to 2001
- Budget: Approx. 5.4 billion yen
- (50million US\$, 60million EURO)

Purpose

- Development of automobile and fuel technologies for a better environment



JCAP Organization



Objectives

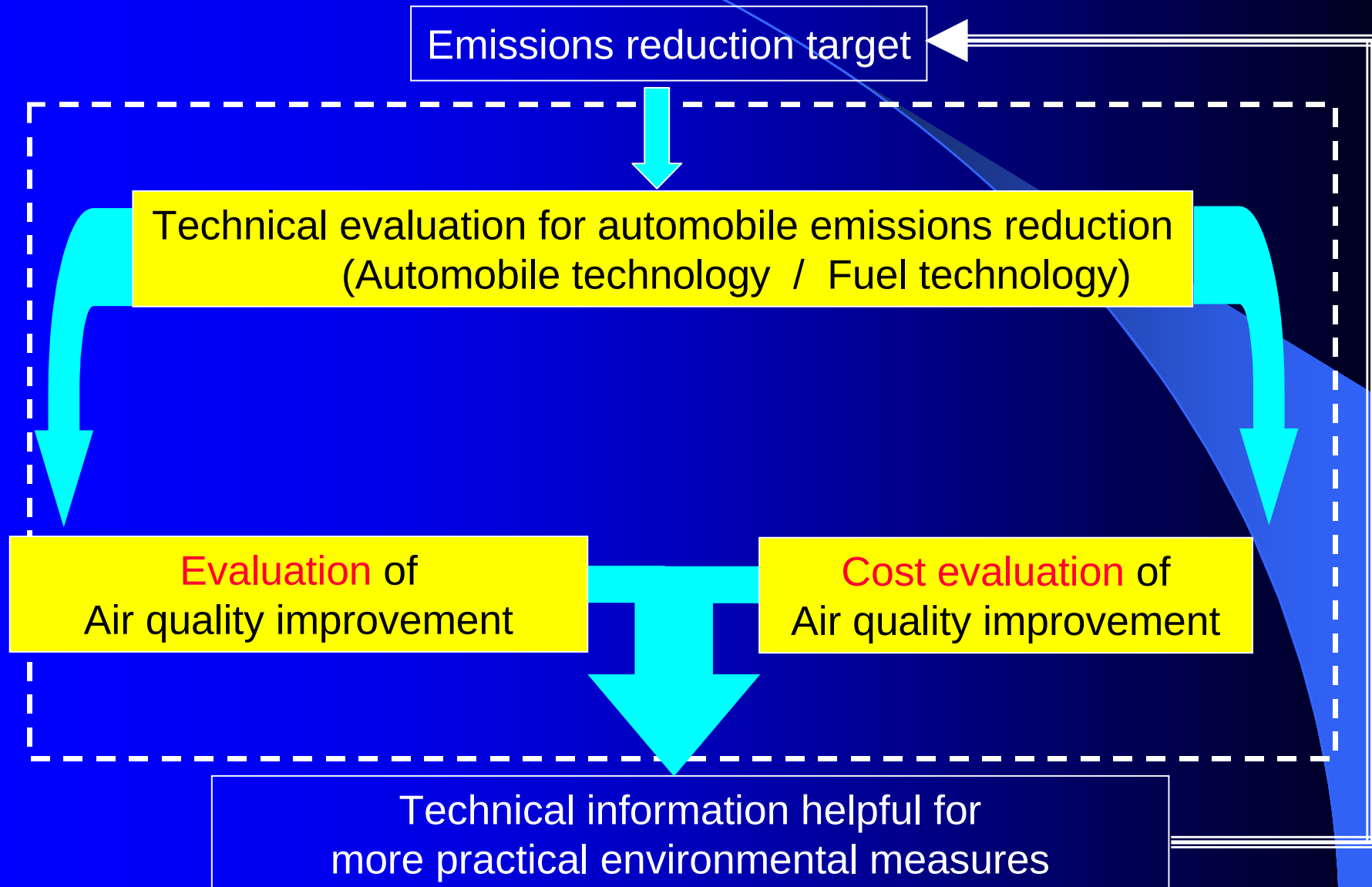


- Identify future automobile and fuel technologies to improve the environment
- Forecast improvements in air quality through the introduction of new technologies for emissions reduction technologies
- Evaluate the costs and effects of air quality improvement and provide technical information helpful for more reasonable environmental measures

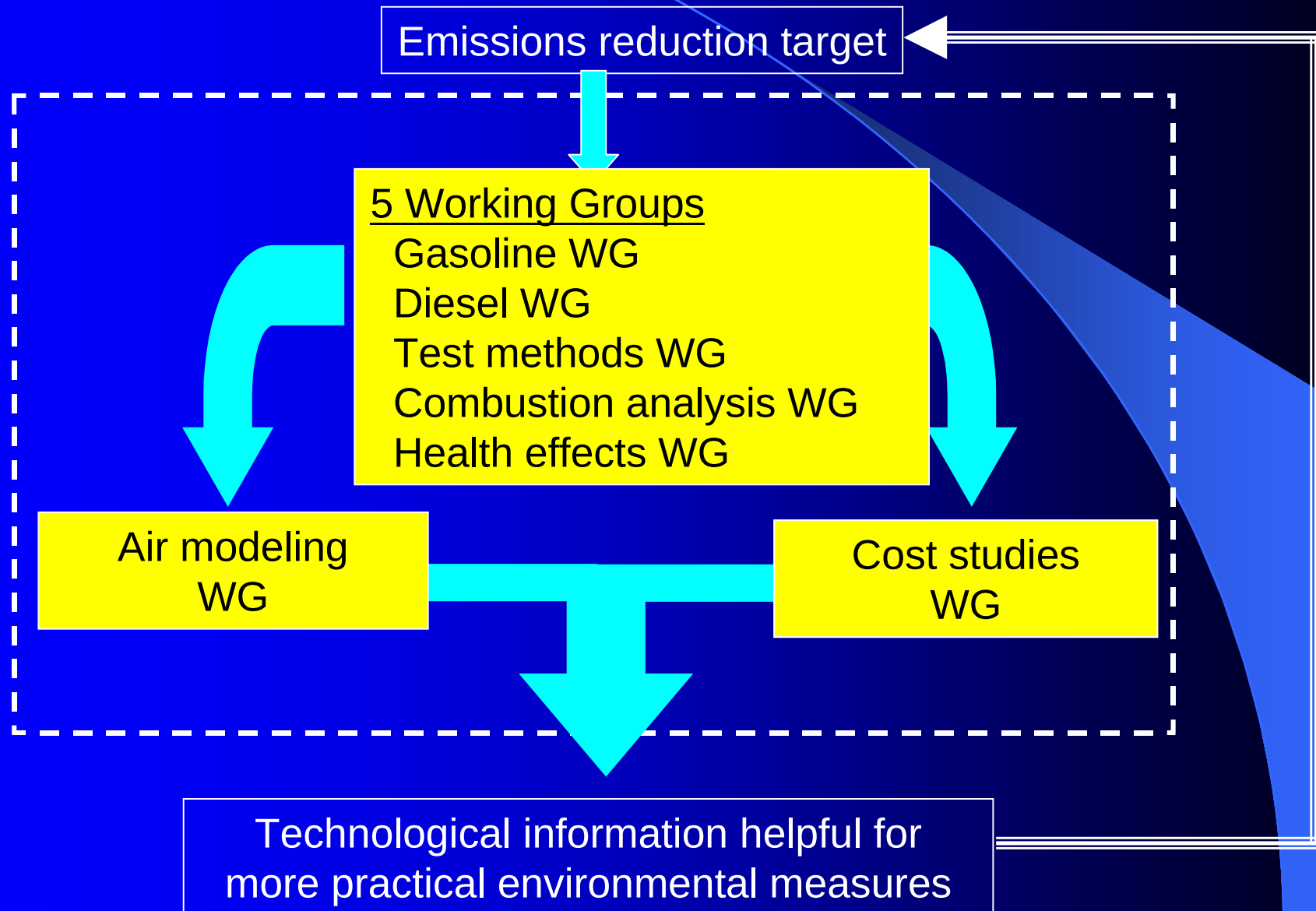
Schedule

	STEP I (1997, 98)	STEP II (1999-2001)
Technical evaluation	Existing vehicle with existing fuel	Future vehicle with future fuel
Atmospheric effect evaluation	Development of basic simulation models	Prediction and verification using simulation models
Economic evaluation	Evaluation methodology study	Research and analysis

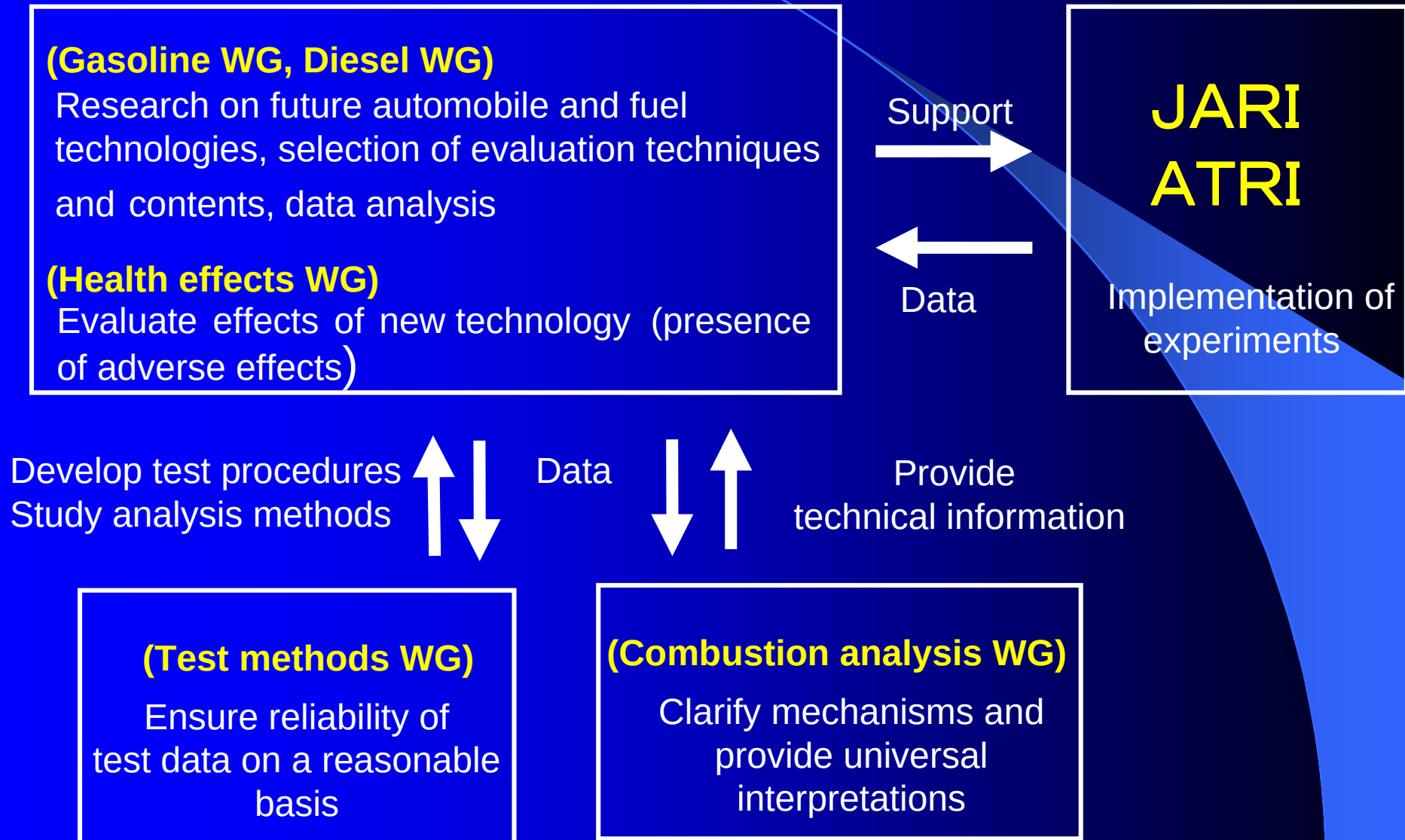
Correlation of Three Objectives



Roles of WG's



Technical Evaluation Scheme



Objectives and Achievements of WG's

- Test methods WG
- Gasoline WG
- Diesel WG
- Combustion analysis WG
- Health effects WG
- Air modeling WG
- Cost Studies WG

Objectives of Test methods WG

Ensure reliability of test data

Role

Tactics

Elimination of measurement errors

Data deviations across several test institutions : Cross check
Effects from test order : Randomization

Efficient test plan/analysis

: Experimental design

Study of new test methods

: Collaboration with
overseas researchers

Achievement of Test methods WG

1. Data reliability

First step is achieved by development of a test procedure, implementation of cross check and instruction on data analysis procedures.

2. Study of new test methods

PM particulate diameter measurement methods for diesel emissions were researched.

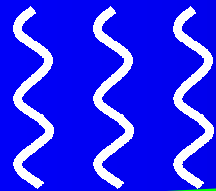
At present, no proven techniques are available.

→ Study results to be used as reference data by JCAP

Objectives of Gasoline WG

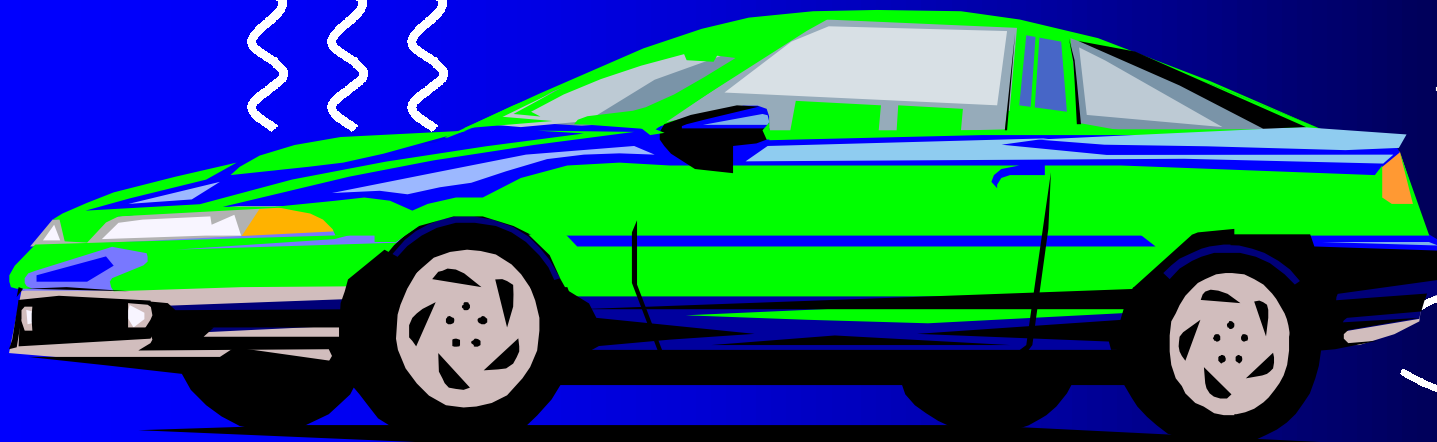
Development of automobile and fuel technologies for reduction of gasoline vehicle emissions

Evaporative emission
(evaporation gas)



Tailpipe emission

CO, HC, NOx, etc.

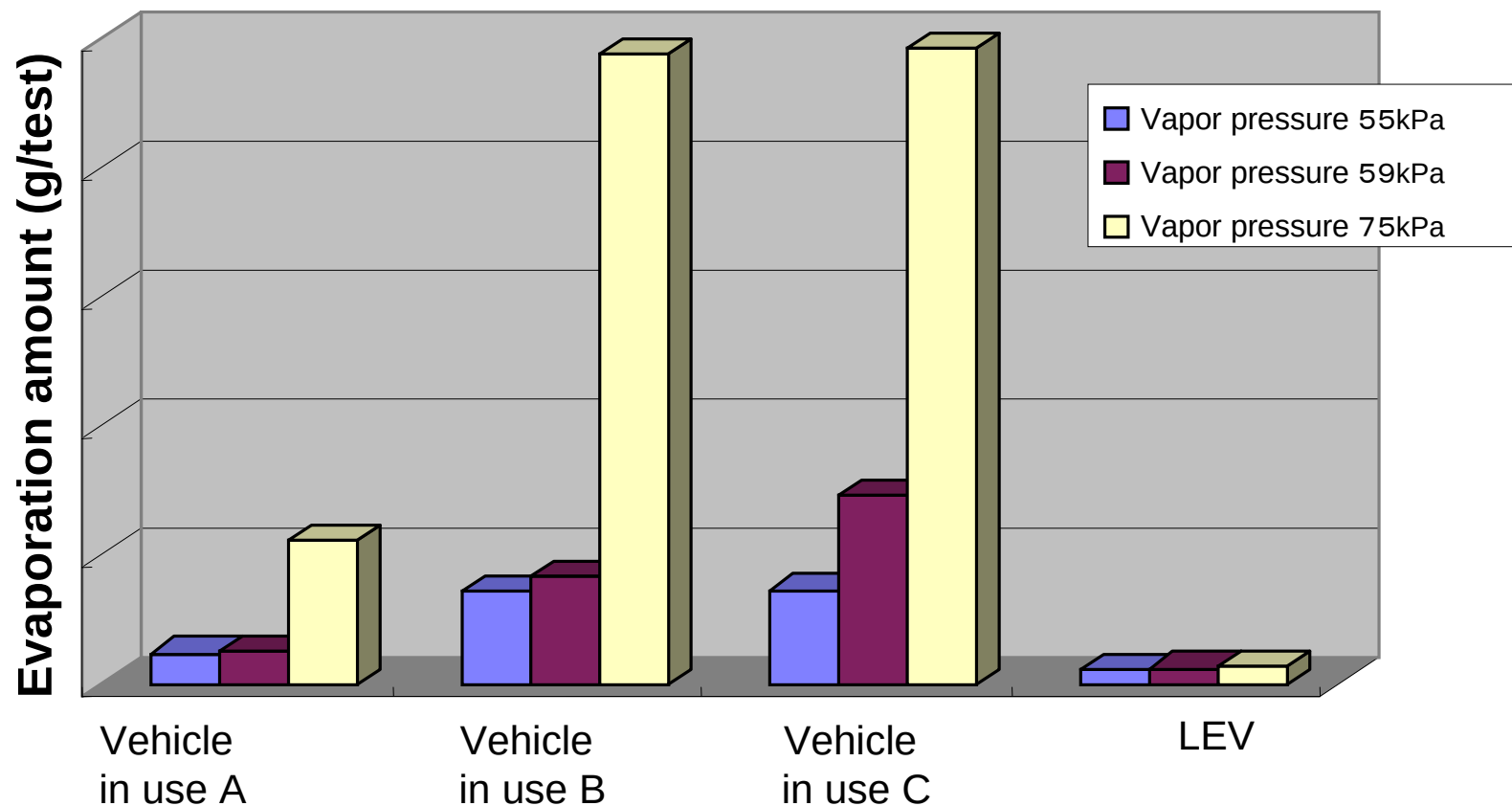


Example of Achievements 1

(Gasoline WG)

Evaporative Emission

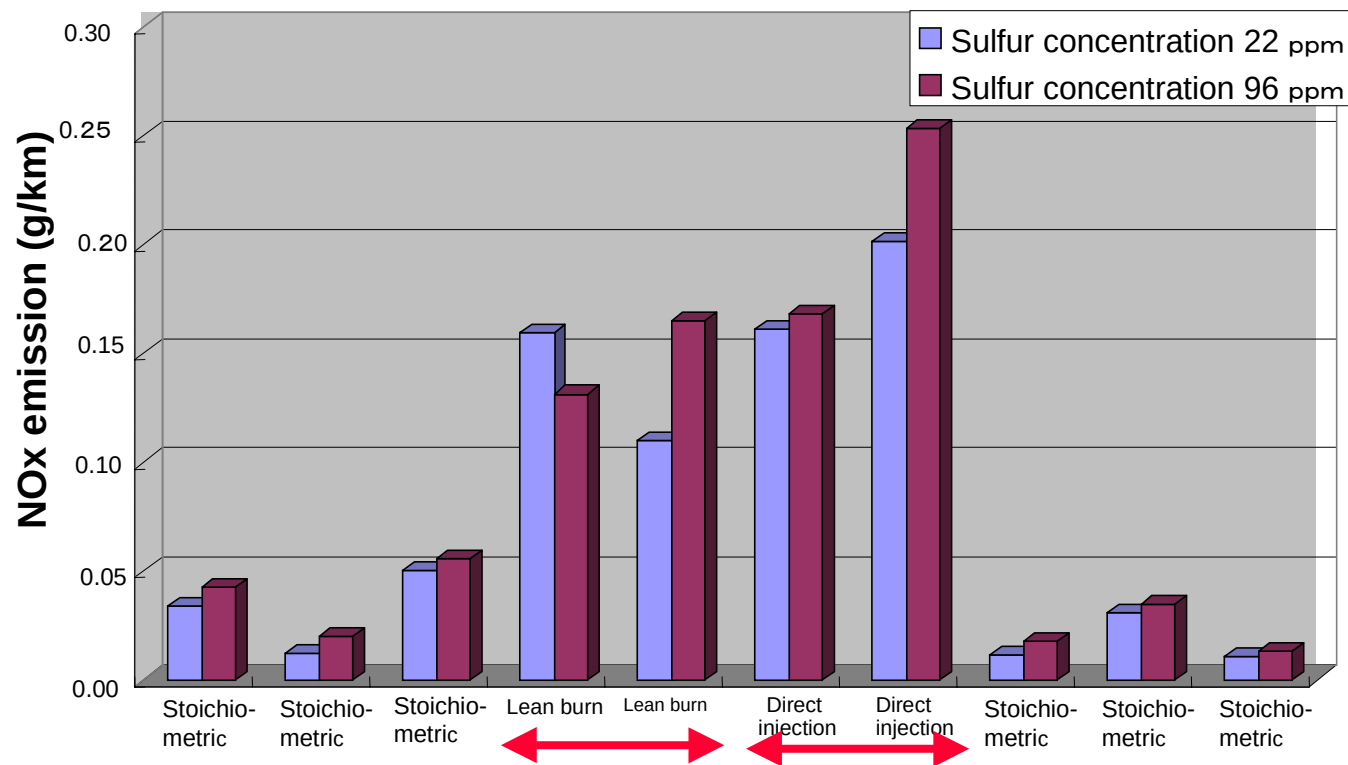
Low gasoline vapor pressure considerably reduces the evaporative emissions. Automobile technologies have much effect (canister capacity is especially key).



Example of Achievements 2 (Gasoline WG)

Tailpipe Emission (NOx in 10/15 mode)

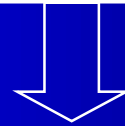
Lower amount of sulfur in gasoline leads to lower NOx levels. This tendency is obvious especially in DI engines and lean burn engines.



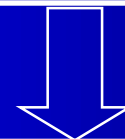
Lean burn Direct injection

Progress in Step II (Gasoline WG)

- Exhaust gas target: Half of Year 2000 regulation level (one-sixth of Year 1978 level)
- Focus on DI engines as the main subject of study (Assume need of future CO₂ emission reduction)



Lean NO_x catalyst needed for Exhaust emission reduction in DI.
Lean NO_x catalyst: Significant catalyst deterioration effect is expected due to sulfur contained in gasoline.



Long mileage drive test is underway
(To study the effects of sulfur in gasoline on catalyst performance)

** Testing to be completed in December 2000.*

Objectives of Diesel WG

Development of automobile and fuel technologies
for reduction of diesel vehicle emissions



Achievements of Diesel WG

To be presented in a separate session

Achievements in Step I

Plan for Step II

Countermeasures for diesel vehicles in use

Objectives and Achievements of Combustion analysis WG

1. Objectives

To clarify technological mechanisms endorsing the test results and to provide universal interpretations.

2. Achievements

- Literature search, discussions with domestic and foreign experts
- Implementation of basic study with single cylinder engines
- Entrustment of combustion base studies and evaluation of the study results



Utilize these for interpretation of test data

Objectives and Achievements of Health effects WG

1. Objectives

To organize information on the health effects of diesel emission pollutants and to verify that a new emission reduction technology does not present adverse effects to living organisms.

2. Achievements

- Domestic and foreign data collected and organized into a report
→ Utilized for the diesel emission effects research conducted by the Japan Environment Agency.
- Ames test method selected as a evaluation method for health effects.

Objectives of Air modeling WG

Improvement of air quality
Ozone, NO₂, SPM, etc.



Development/Verification/Evaluation of
Atmospheric Quality Improvement Simulation Model



Exhaust Gas Reduction
CO, HC, NO_x, PM, etc.



Automobile Technology / Fuel Technology

Achievements of Air modeling WG

To be presented in a separate session

Achievements in Step I

Plan for Step II

Evaluation of PM reduction technologies
for vehicles in use

Objectives of Cost studies WG

Evaluation of Costs and Effects of air quality
Improvement

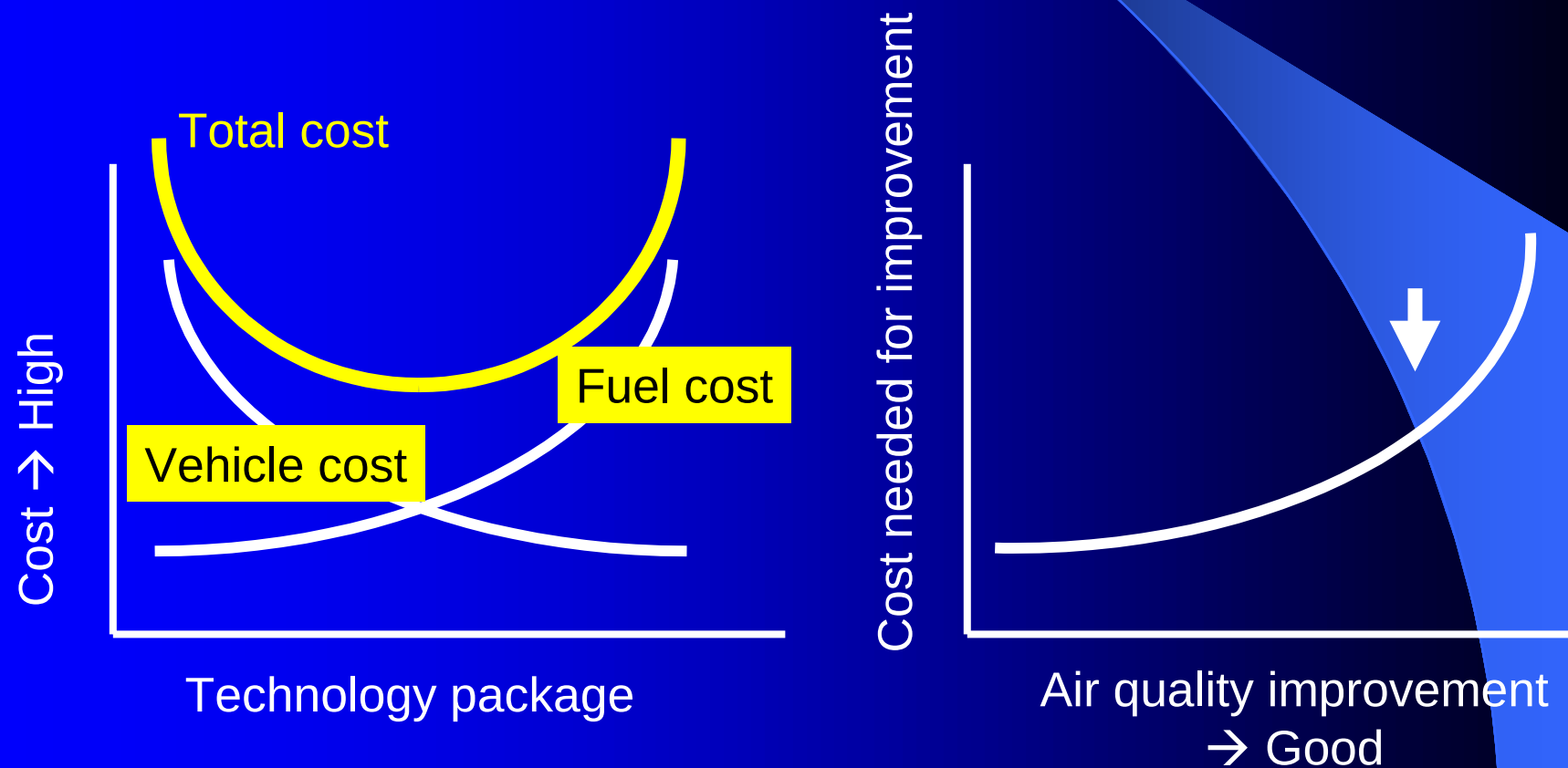
Automobile technology
Fuel technology

Atmospheric model
evaluation result

Example of Achievements 1

(Cost studies WG)

How to Express Outputs (under discussion)



Example of Achievements 2

(Cost studies WG)

Cost Research Method

Questionnaire was suggested as the optimum method.

Already tried out with the gasoline vehicle evaporative emission reduction set up as the theme.

The trial questionnaire responded to automotive manufacturers and petroleum companies indicates that significantly **reliable data can be obtained**.

- * A package of automobile technologies and fuel technologies for tailpipe emission reduction has been determined. A questionnaire study regarding cost is currently underway.

Next Step

- Summary (draft)
- Future schedule

Summary (draft)

WG name	Summary contents (draft)
Test methods	Achieved test reliability Result of diesel PM diameter measurement
Gasoline	Drive test result (Vehicle technology vs sulfur level) Evaporative test result (- 3DBL vs evaporative pressure)
Diesel	Drive test result (Vehicle technology vs sulfur level) Matrix test result (Vehicle technology vs sulfur level, distillation characteristics)
Combustion analysis	Clarification of technical mechanisms endorsing the test results and provision of universal interpretations
Health effects	Evaluation of effects resulting from diesel emission reduction measures (Check for adverse effects by mutagenicity tests)

Summary (draft)

WG name	Summary contents (draft)
Air modeling	-Verification result of model's simulation accuracy -Emission reduction result (wide areas, along main roads) -The subjects include direct emissions, ozone, and secondary PM.
Cost studies	-Evaluation of costs and effects of air quality improvement (Gasoline vehicle countermeasures, diesel vehicle countermeasures) -Research and evaluation on consumers' limit of acceptance regarding air quality improvement

Future Schedule

Fiscal Year 2000			Fiscal Year 2001			
9	12	3	6	9	12	3
* Achievement Presentation (2nd)				Interim summary		
STEP II main study				*		
					Final summary	
				Supplementary study		*
						*
					Achievement Presentation (3rd)	

END