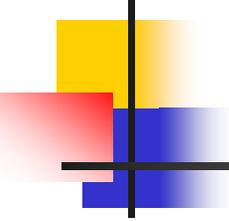


# GRPE OFF-CYCLE EMISSIONS MEETING

June 5, 2007

EMA Proposal to Replace Altitude with  
Barometric Pressure to Define  
Conditions where WNTE Applies

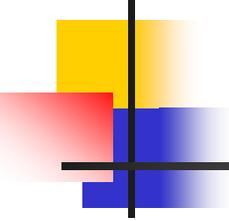
Engine Manufacturers Association



# Introduction

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- Currently ambient conditions where WNTE applies are defined based on ambient temperature and altitude (section 6)
- With exception of unit changes, these conditions are modeled after US NTE regulations
- EMA proposes that the applicable conditions be defined based on ambient temperature and barometric pressure
  - It is not EMA's intent to increase or decrease the range of conditions where the WNTE apply



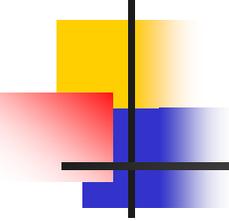
# Rationale for Change

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- Engines do not sense or react to changes in altitude
- Engines do sense barometric pressure
  - Engine air systems and combustion systems react to changes in barometric pressure
  - AECS are often triggered when low barometric pressure is sensed
- There is a strong correlation between altitude and barometric pressure, but:
  - This correlation is imperfect due to changes in meteorological conditions
- EMA believes it is more technically correct to use barometric pressure rather than altitude to define conditions where WNTTE applies.
- Use of barometric pressure also facilitates in-use testing

# Current Conditions for WNTE Applicability

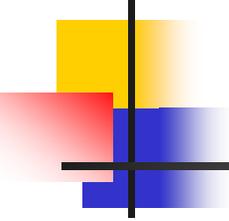
- Currently section 6.2 (Option B) states:
  - The WNTE emission limits apply at all altitudes less than or equal to 1680 meters above sea-level, for temperatures less than or equal to the temperature determined by the following equation at the specified altitude:
    - $T = -0.00464 \times A + 37.8$  where:
      - T= ambient air temperature in degrees Celsius
      - A= altitude in meters above sea level (A is negative for altitudes below sea-level)



# EMA Proposal for Applicable Range of Barometric Pressure

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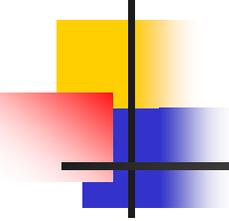
- A standard atmosphere has a pressure of 100 kPa at sealevel
- A standard atmosphere has a pressure of 82.73 kPa at 1680 meters.
- EMA proposes that the WNTE applies for all barometric pressures greater than 82.73 kPa



# EMA Proposal for Applicable Range of Ambient Temperature

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- EMA proposes to maintain the same temperature limits as currently exist in the draft proposal under standard atmospheric conditions
  - 37.8C at 100 kPa (equiv to std atm at sealevel)
  - 30.0C at 82.73 kPa (equiv to std atm at 1680 m)



# EMA Proposal

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- Revise section 6.2 to read:

The WNTE emission limits apply at all barometric pressures greater than or equal to 82.73 kPa, for temperatures less than or equal to the temperature determined by the following equation at the specified altitude:

$$T = -0.4514 \times (100-A) + 37.8 \quad \text{where:}$$

T= ambient air temperature in degrees Celsius

A= atmospheric (barometric) pressure in kPa