

AIRPORT RUNWAY ROUGHNESS ASSESSMENT USING A ROAD SURFACE PROFILER

ARTURO ESPINOZA AND GEN LONG

APPLIED PAVEMENT TECHNOLOGY, INC. (APTECH)



PROJECT OVERVIEW



IN THE FALL OF 2021, APTECH CONDUCTED ROUGHNESS TESTING USING A ROAD SURFACE PROFILER INSTALLED ON ITS AUTOMATED DATA COLLECTION VEHICLE

THE ROUGHNESS TESTING WAS A PART OF A BROADER AIRFIELD DESIGN SERVICES CONTRACT, APTECH CONDUCTED A FIELD INSPECTION AND RUNWAY PROFILE TESTING AT A MAJOR COMMERCIAL AIRPORT

THE PROFILE TESTING WAS PART OF A STUDY TO IDENTIFY THE MAINTENANCE AND REHABILITATION (M&R) NEEDS FOR THE AIRPORT'S INFRASTRUCTURE

AIRPORT ROUGHNESS



PAVEMENT ROUGHNESS ASSESSMENT OF ROADWAY FACILITIES IS PRIMARILY FOCUSED ON DETERMINING THE RIDE QUALITY EXPERIENCED BY VEHICLE PASSENGERS (DISCOMFORT)

IN AN AIRFIELD SETTING, THE EMPHASIS OF ROUGHNESS ASSESSMENT IS ON THE INCREASED WEAR AND TEAR ON AIRCRAFT SUSPENSION COMPONENTS CAUSED BY SURFACE IRREGULARITIES

THREE TYPES OF STRUCTURAL CONCERNS AFFECTING AIRCRAFT (ROGINSKI, 2012)

1. LIMIT LOADS – DISCRETE BUMPS THAT COULD INDUCE STRUCTURAL FAILURE
2. FATIGUE LOADS – CONTINUOUS LARGE WAVELENGTH BUMPS EXCEEDING ONCE PER FLIGHT LIMITS
3. LANDING GEAR TRUCK PIVOT JOINT – CONTINUOUS SHORT WAVELENGTH BUMPS

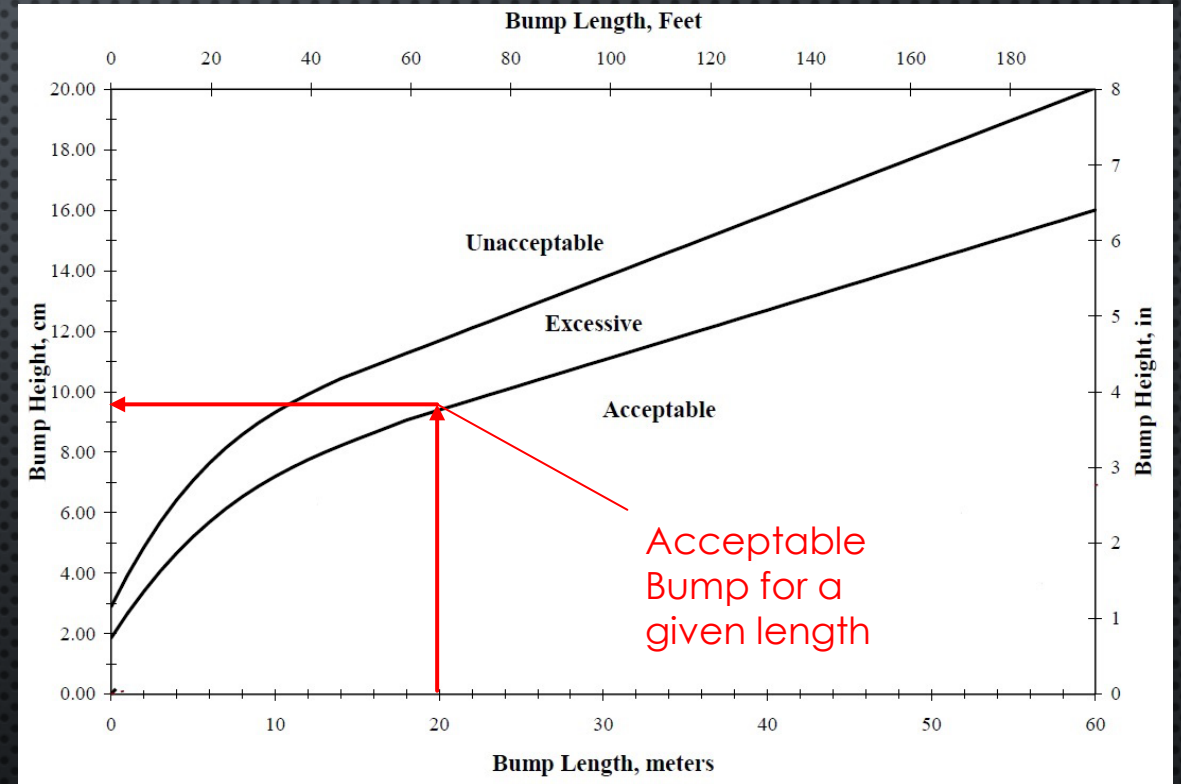
BOEING BUMP INDEX (BBI)



USES A “VIRTUAL” STRAIGHT EDGE BETWEEN POINTS ON THE LONGITUDINAL PROFILE TO MEASURE BUMP HEIGHTS AND LENGTHS

CALCULATE RATIO BETWEEN THE MEASURED AND ACCEPTABLE BUMP HEIGHTS

FAA ADVISORY CIRCULAR (AC) 150/5380-9 (GUIDELINES AND PROCEDURES FOR MEASURING AIRFIELD PAVEMENT ROUGHNESS) OUTLINES PROCEDURE AND REQUIREMENTS

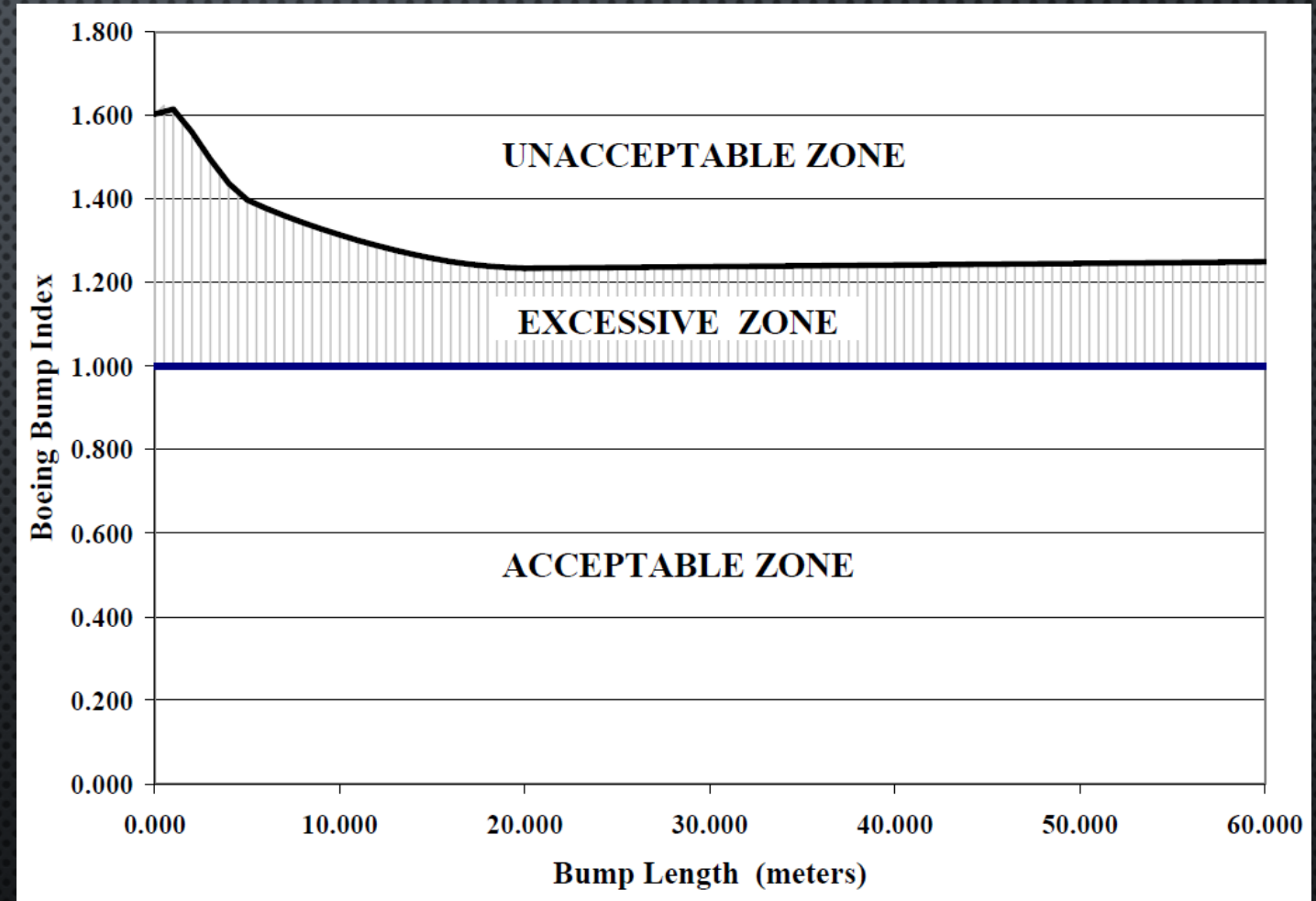


BOEING BUMP INDEX (BBI), cont



FOR BBI VALUE < 1.0 , THE BOEING BUMP CRITERIA IS IN THE ACCEPTABLE ZONE

BBI VALUES > 1.0 FALL IN EITHER THE EXCESSIVE OR UNACCEPTABLE ZONES

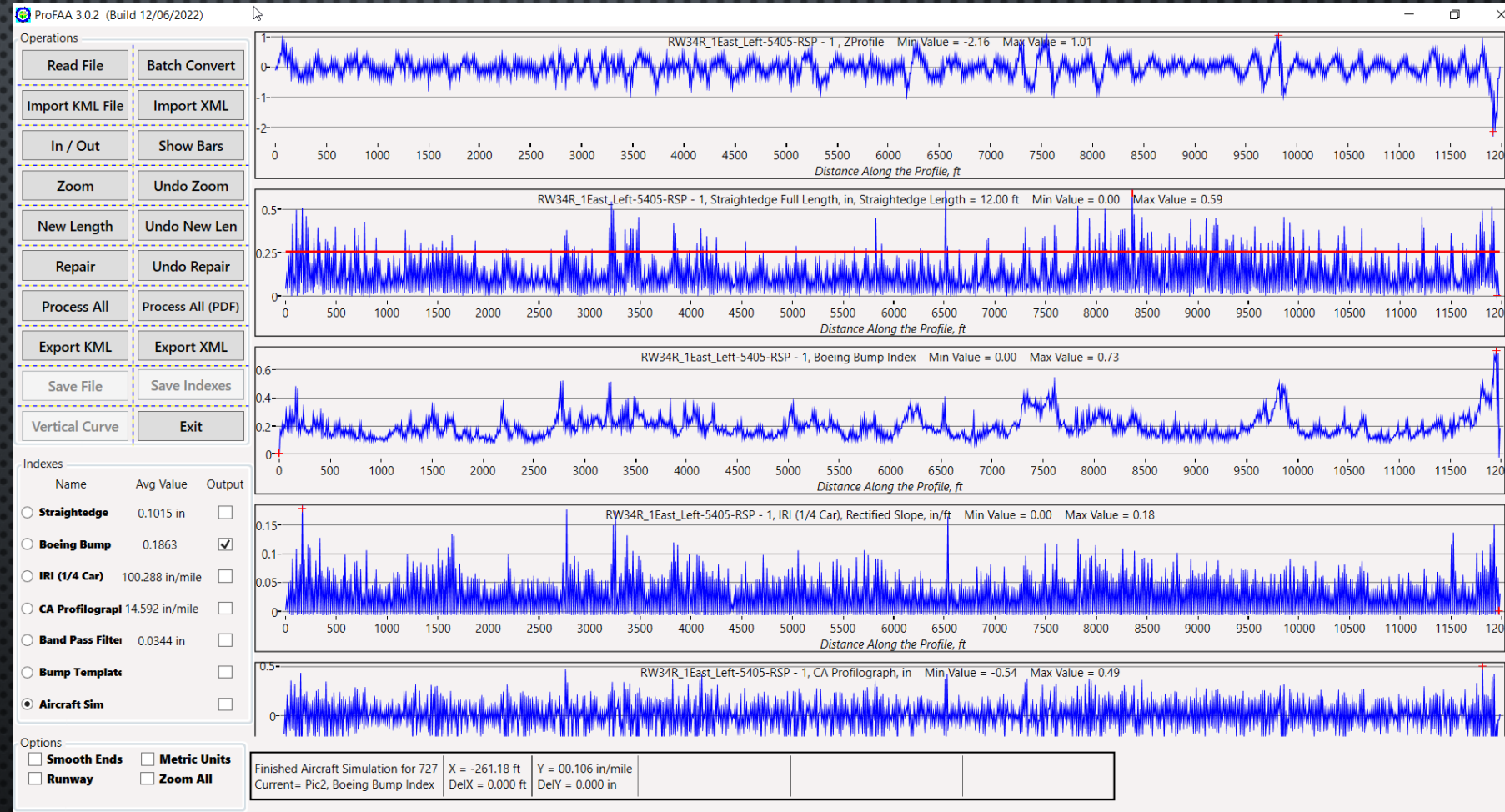


CALCULATING BBI – PROFAA



THE FAA DEVELOPED
THE PROFAA SOFTWARE
TO CALCULATE BBI

COMPANION FILE
FORMAT CONVERTER
APP TO CONVERT FROM
COMMON FILE FORMATS
TO PROFAA STYLE
*.PRO FORMAT



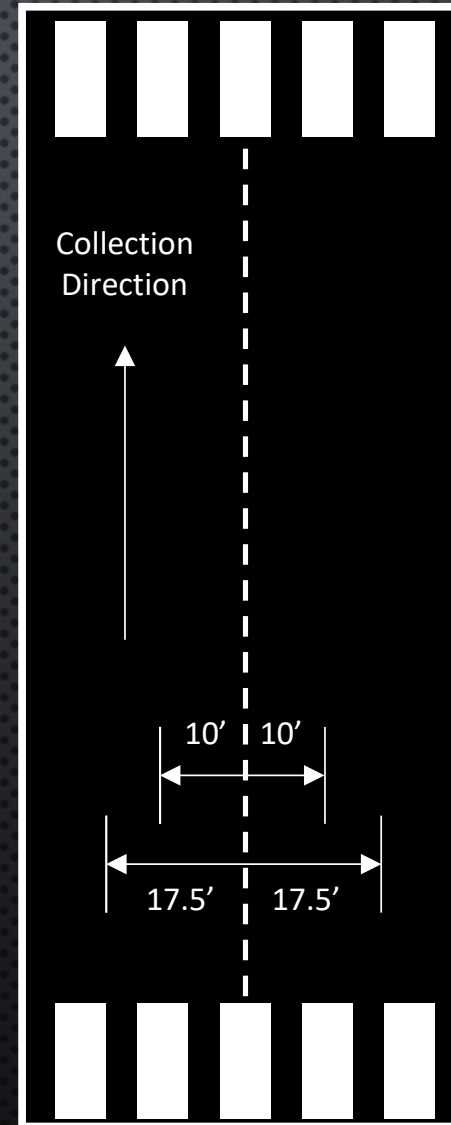
DATA COLLECTION PROCESS



DATA COLLECTED AT TWO OFFSETS ON EACH SIDE OF THE RUNWAY CENTERLINE

- 10-FT
- 17.5-FT

OFFSETS BASED ON FAA AC RECOMMENDATIONS FOR THE RANGE OF AIRCRAFT SIZES AND DESIGN GROUPS EXPECTED FOR THE FACILITY



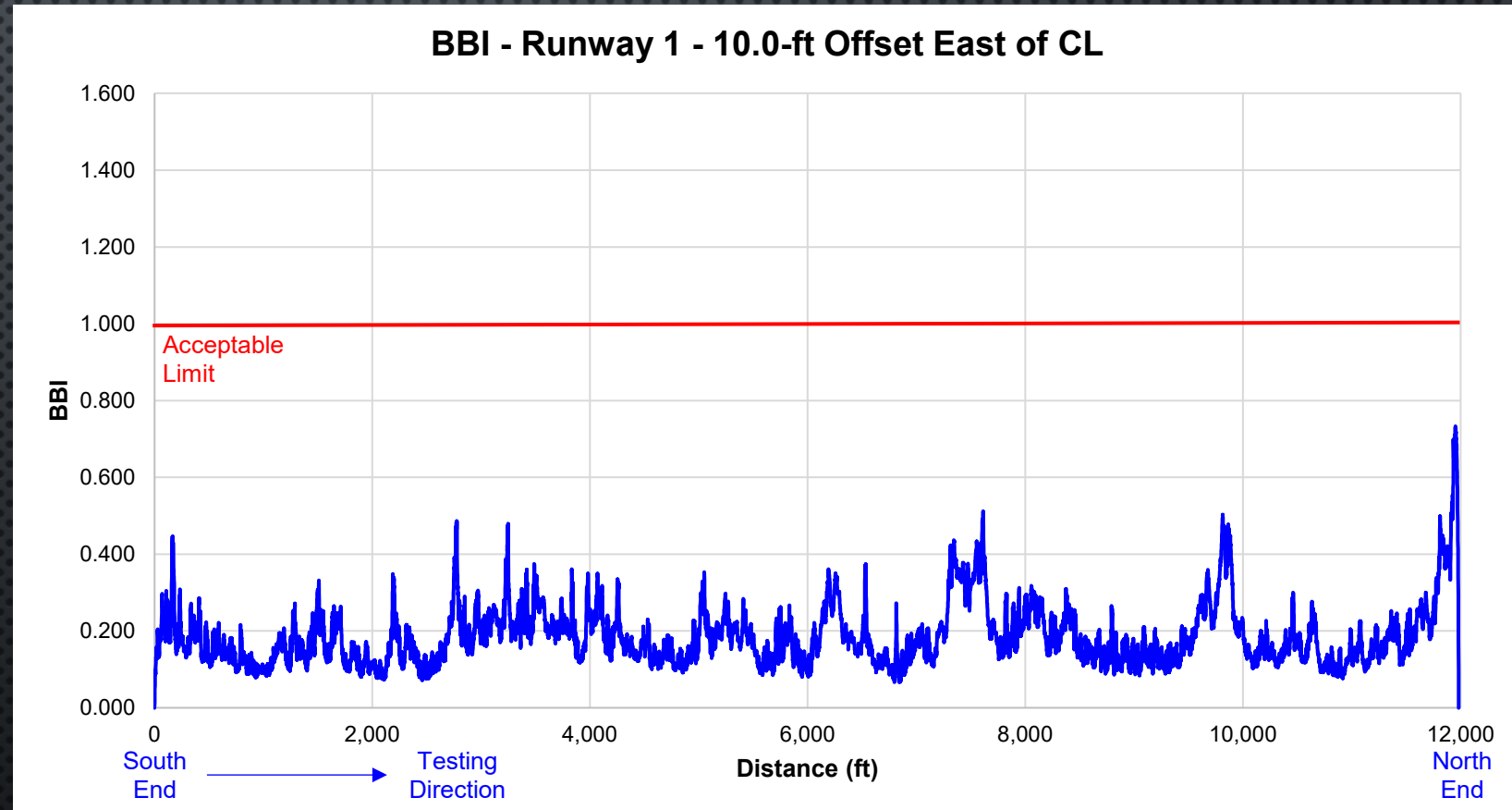
TESTING RESULTS



FOR EACH RUNWAY, THE DATA COVERING THE 10-FT OR 17.5-FT OFFSET WAS SELECTED, PROCESSED, AND FILTERED TO OBTAIN A CONTINUOUS BBI SERIES

LEAD-IN AND LEAD-OUT TAILS WERE CLEANED

NONE OF THE TEST RUNS EXHIBITED A BBI OVER 1.000



CONCLUSIONS AND LIMITATIONS



CHECKING FOR EXCESSIVE ROUGHNESS ON AIRPORT RUNWAYS IS AN IMPORTANT STEP FOR THE DEVELOPMENT OF M&R RECOMMENDATIONS

BBI IS AN EASILY APPLICABLE INDUSTRY STANDARD, BY USING INERTIAL PROFILER DATA COMBINED WITH PROFAA

THE BBI METHODOLOGY IS EFFECTIVE AT IDENTIFYING SINGLE-EVENT BUMPS OR DIPS THAT CAN AFFECT AIRCRAFT COMPONENTS, BUT OTHER ROUGHNESS FACTORS MIGHT NOT BE ACCURATELY REPRESENTED IN THE METHODOLOGY

A CLEAR DATA COLLECTION PLAN IS NEEDED TO ENSURE DATA QUALITY CONSISTENCY AND ACCURACY

THANK YOU!

- Arturo Espinoza: aespinoza@appliedpavement.com
- Gen Long: glong@appliedpavement.com