

Clearance obstacles enhancement performance new procedure in CAT A PC1 Take Off

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CATEGORY A ALTERNATIVE STEEP TAKEOFF PROCEDURES

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CATEGORY A ALTERNATIVE STEEP TAKEOFF PROCEDURES

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INTRODUCTION 1/2

- A Category A take-off procedure, as prescribed by 29.51, requires to reach 1000 ft AGL through 2 climb segments.
- 29.1587 requires publishing the first and second segment gradients to allow the crew to determine the take-off path and guarantee obstacle clearance.
- The first climb segment starts when reaching V_{TOSS} , and a positive rate of climb and ends when the rotorcraft reaches 200 ft ASL. At least 100 fpm RoC must be guaranteed at 2.5' (or 30") OEI
- The second segment starts at 200 ft AGL and ends at 1000 ft ASL. It is supposed to be flown at a speed selected by the applicant (that can be depending on weight and/or ambient conditions). The acceleration between V_{TOSS} and this selected speed is conventionally flown in level flight



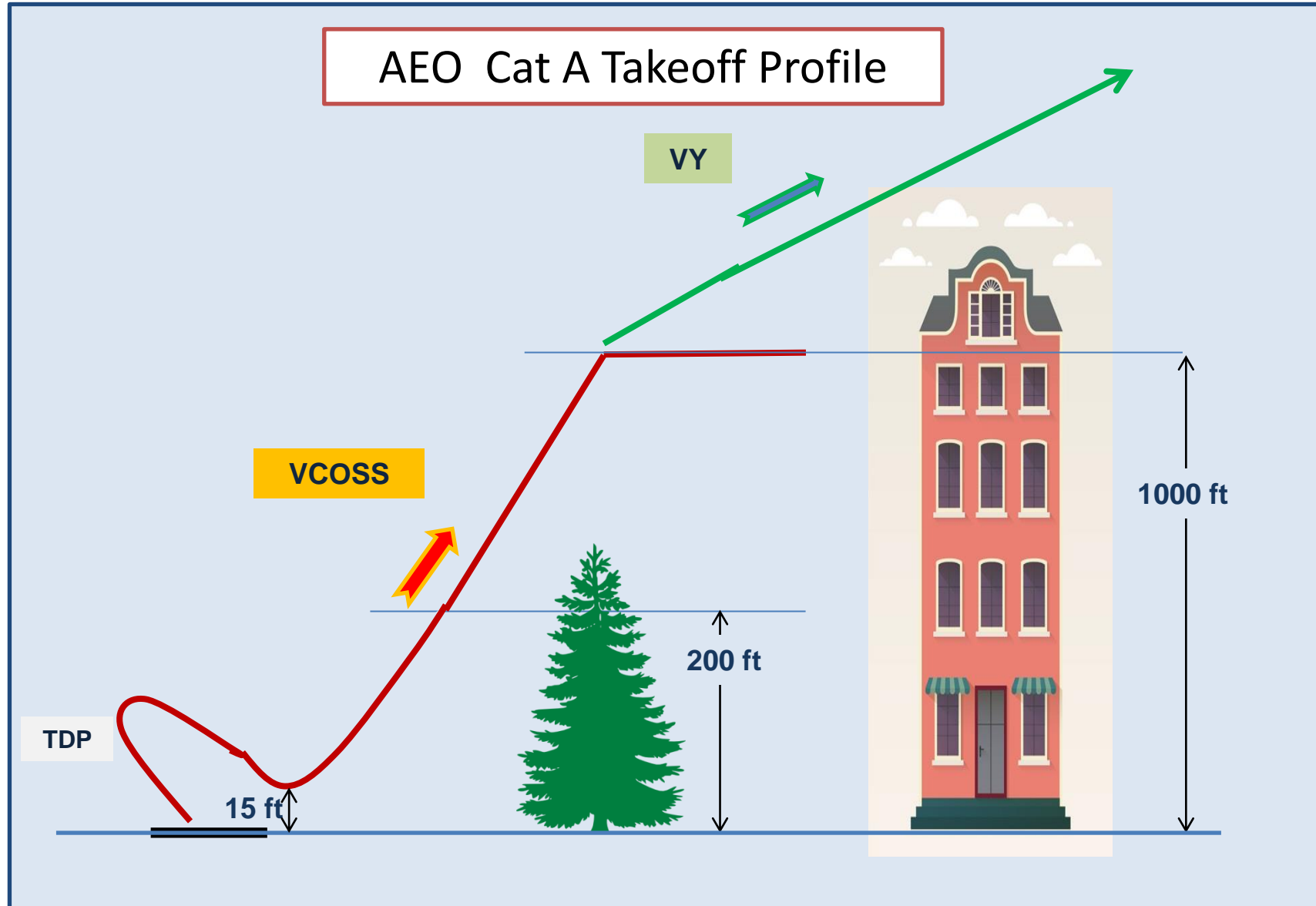
INTRODUCTION 2/2

- During this second climb segment, at least 150 fpm RoC must be guaranteed at OEI Maximum Continuous Power (OEI MCP) rating.
- When the OEI power available is adequate, the entire take off profile (up to 1000 ft ASL) can be flown before 2.5' OEI rating expiration at a speed midway between V_{TOSS} and V_Y in the entire Cat A take-off and landing envelope. This intermediate speed, that LH calls V_{COSS} (Climb-Out Safety Speed), provides a steeper gradient to the completion of the take-off profile clearing closer obstacles when compared to a climb at V_Y using OEI MCP, that requires an acceleration at constant altitude.
- LH has introduced this new procedure with the associated performance charts in addition or in alternative to the conventional procedure in order to reduce workload and provide improved obstacle clearance.



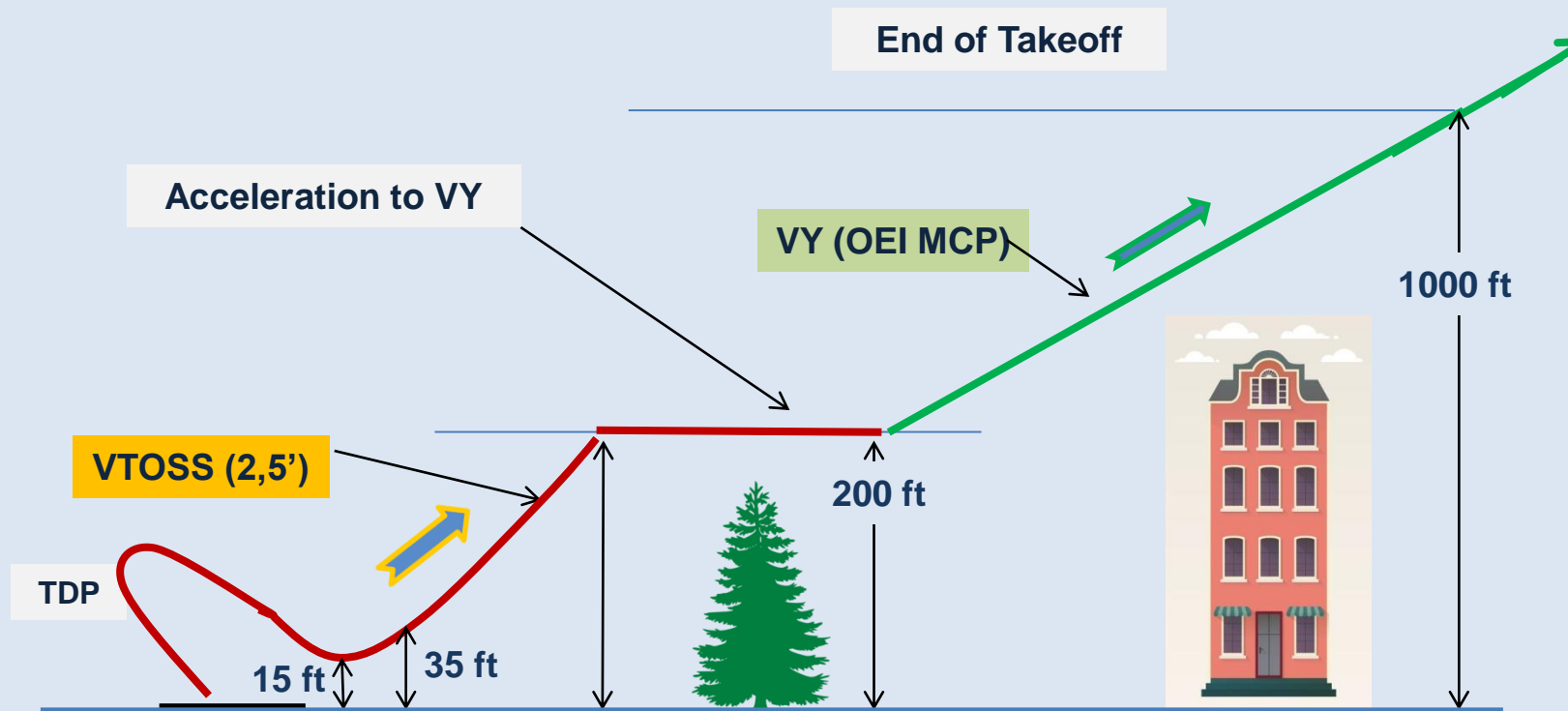
CAT A BASIC TAKEOFF REQUIREMENTS

1. The first climb segment starts when reaching V_{TOSS} , and a positive rate of climb and ends when the rotorcraft reaches 200 ft ASL. During this first climb segment a minimum of at least 100 fpm RoC with the 2.5' OEI rating, the landing gear down and V_{TOSS} has to be guaranteed.
2. The second segment starts at 200 ft AGL and ends at 1000 ft ASL. It is supposed to be flown at a speed selected by the applicant (that can be depending on weight and/or ambient conditions). During this second climb segment, at least 150 fpm RoC must be guaranteed at OEI Maximum Continuous Power (OEI MCP) rating, landing gear up with the speed selected by the applicant. Typically, the speed selected is V_Y to maximize the climb performance.





Cat A Conventional Performance Profile without Intruding Obstacles





Alternate Possible Procedures

AC29.67 One Engine Inoperative, at Procedures paragraph (b)(1) states:

- (1) One of the acceptable procedures used to obtain the required climb performance is similar to the all engine climb performance determination (paragraph AC 29.65) except that the V_{TOSS} and the Category A climb speed may be selected by the applicant for different weights and ambient conditions. The Category A climb speed could be a single speed.

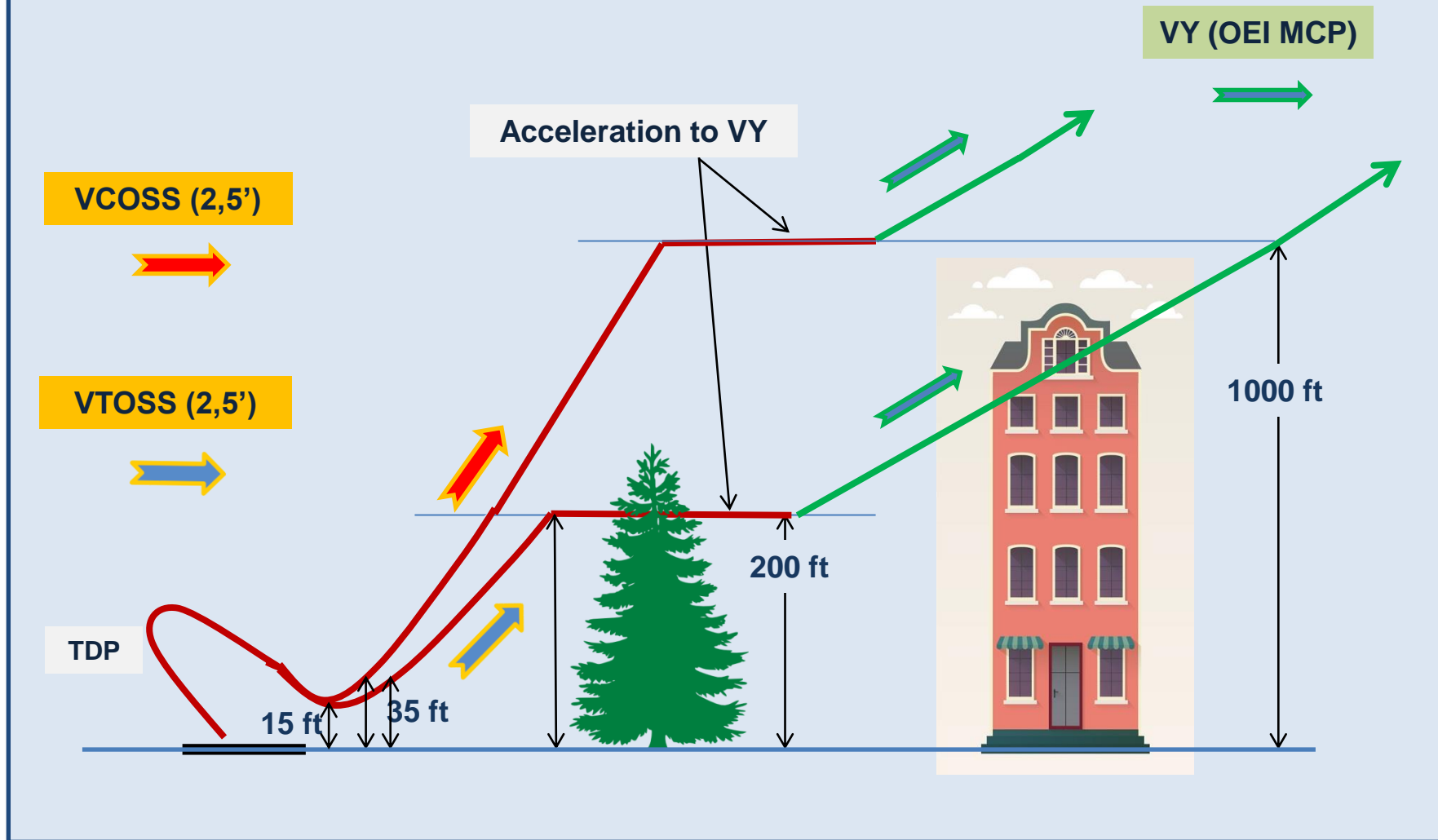


Alternate Possible Procedures

- The introduction of the V_{COSS} is in line with this above suggested means of compliance taking advantage of the possibility to use the entire 2.5' OEI rating for a steeper gradient and simplified cockpit procedures.
- With the new procedure, after V_{TOSS} acquisition, the helicopter continues climbing and accelerating to V_{COSS} using the 2.5' rating maintaining V_{COSS} throughout the second segment profile.
- Acceleration to V_Y is then achieved once the 1000 ft are reached before the 2.5' expiration and with a minimum performance of 150 fpm RoC with OEI Maximum Continuous Power guaranteed.

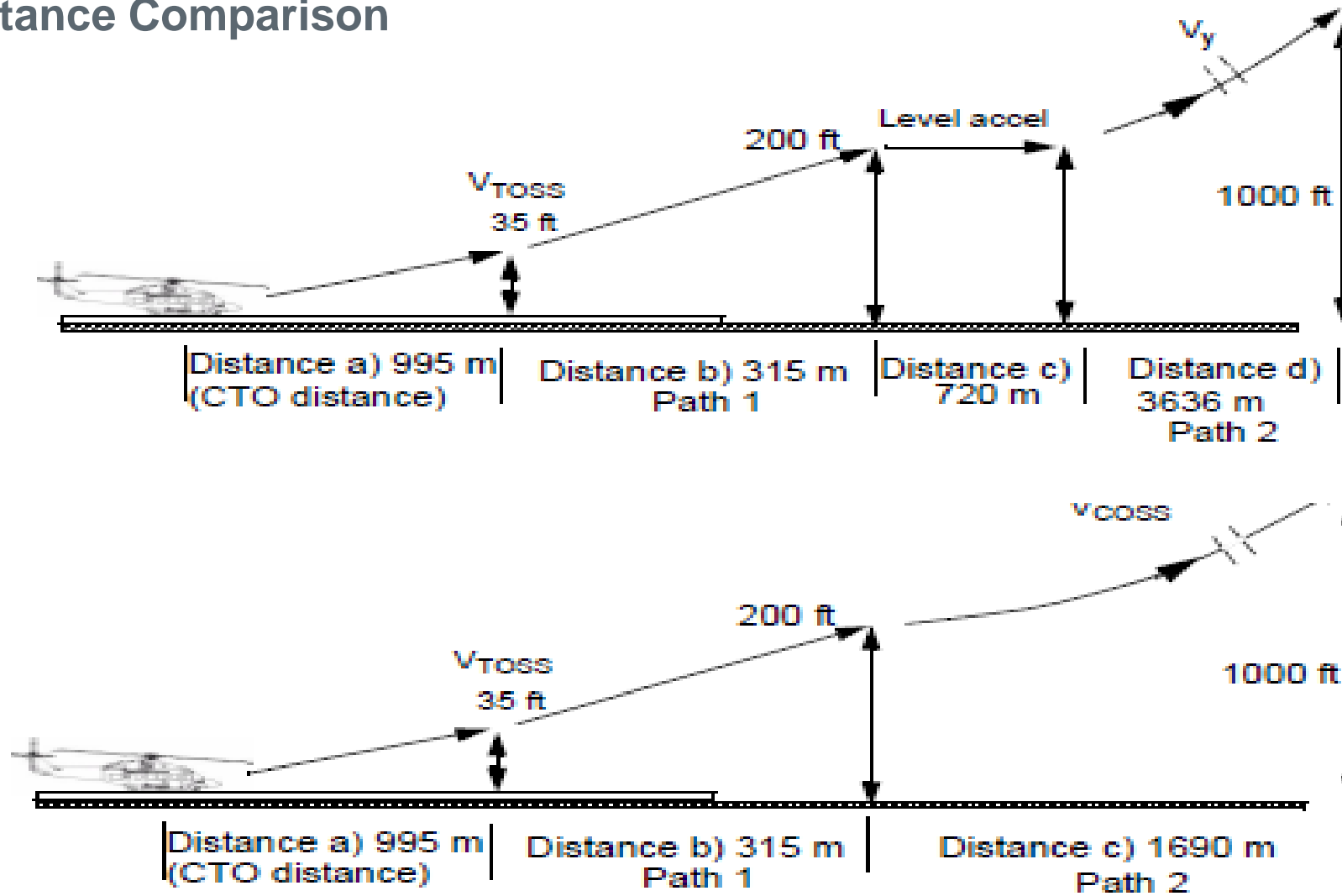


Cat A Improved Performance Profile





Takeoff Distance Comparison



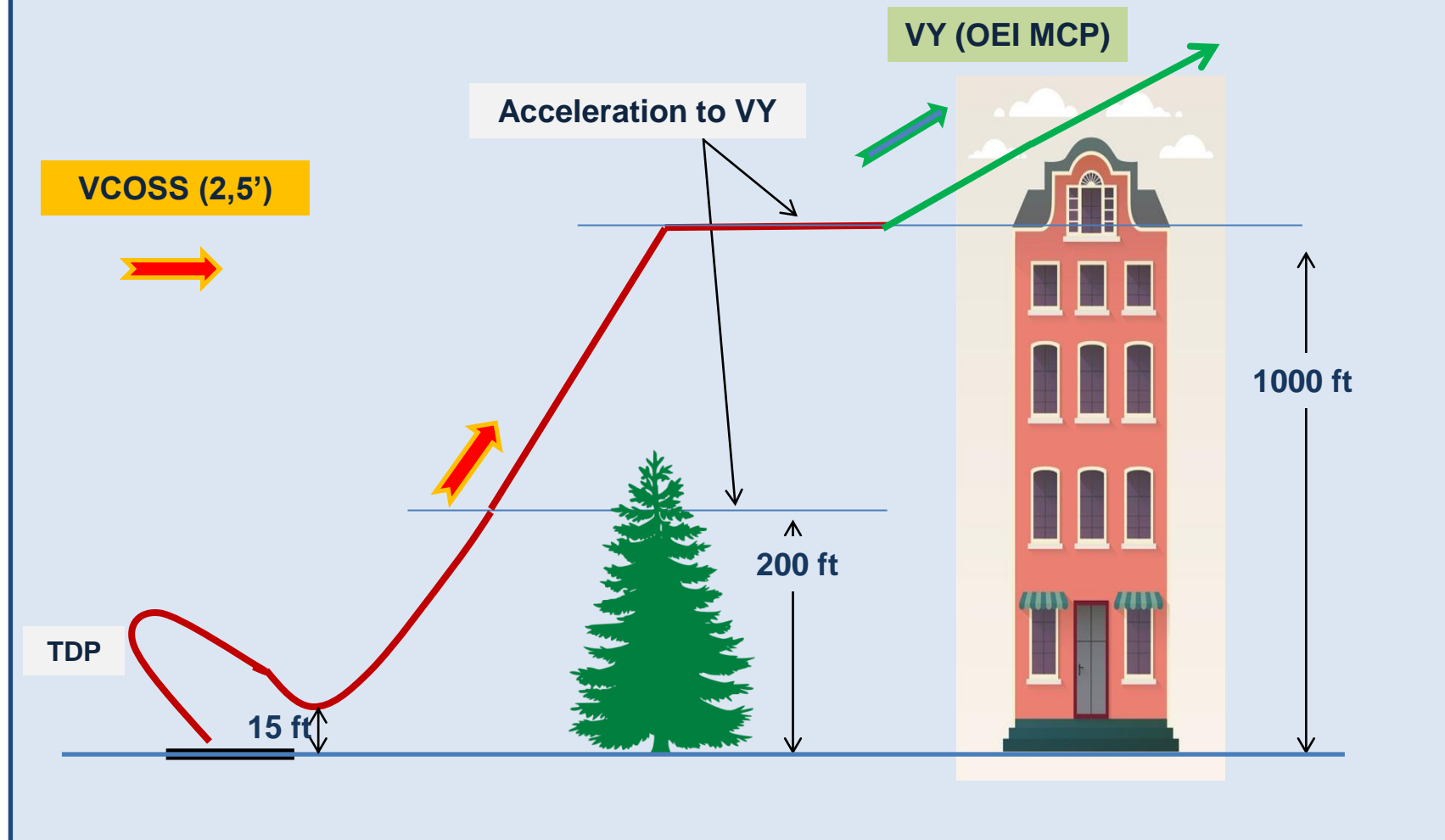


Beyond Cat A Takeoff Climb Requirements

- Takeoff performance information are not enough for a safe and correct scheduled departure when operation under Cat A are required
- Climb capabilities data for obstacle clearance in case of engine failures well beyond the takeoff profile should be published
- A dedicated App developed by LH provides all the Cat A performance charts and subsequent OEI performance for obstacle clearance, even if not strictly required by regulation



Beyond Cat A Takeoff Climb Requirements



Presentation Title



CONCLUSIONS

- The introduction of the V_{COSS} is in line with this above suggested means of compliance taking advantage of the possibility to use the entire 2.5' OEI rating for a steeper gradient and simplified cockpit procedures.
- With the new procedure, after V_{TOSS} acquisition, the helicopter continues climbing and accelerating to V_{COSS} using the 2.5' rating maintaining V_{COSS} throughout the second segment profile.
- Climb capability at V_Y and OEI MCP is guaranteed after acceleration to V_Y at 1000 ft
- More performance information is provided beyond the reaching of 1000 ft height ATS to allow safe departure



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